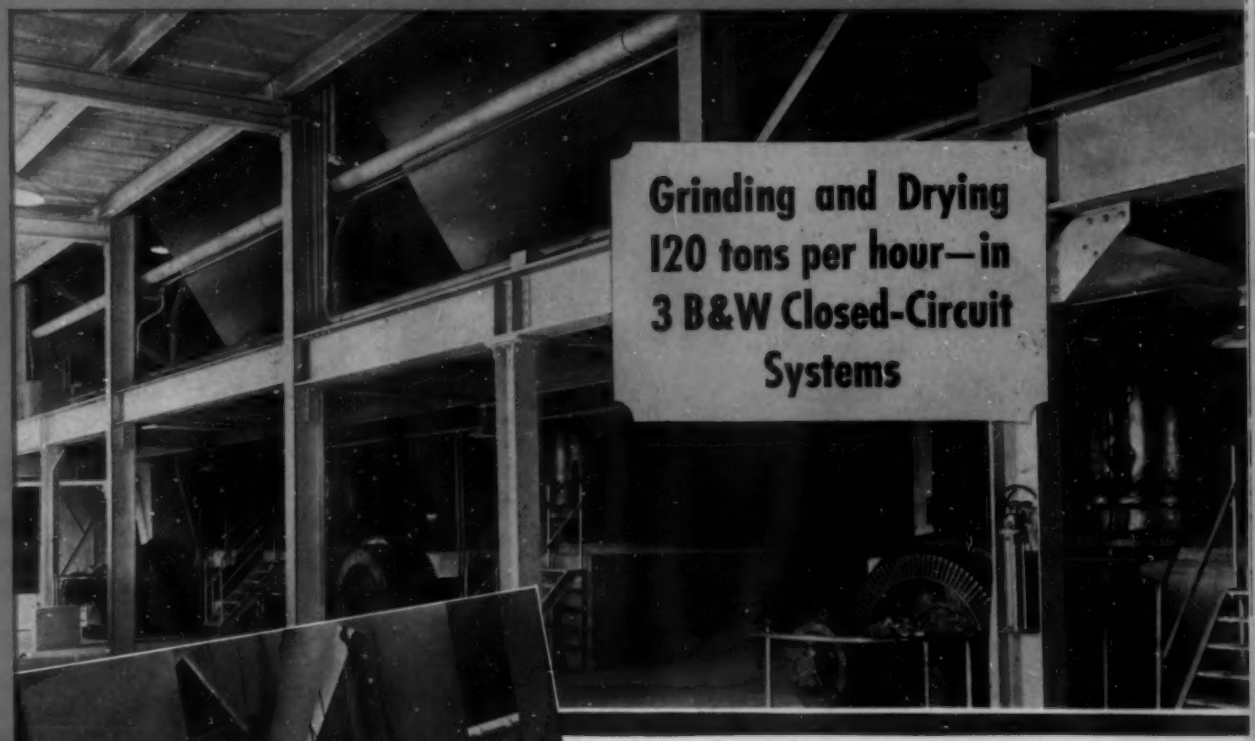
Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY

FEBRUARY, 1939



Grinding and drying limestone and shale — 90 per cent through 200 mesh.

Photographs taken in a prominent eastern plant. Oil furnace (at left), supplies hot air for drying raw material; it consumes less than 0.3 gal. per ton.

This modern plant also uses three B & W Direct-Firing Systems—for low-cost kiln operation.

Bulletin C-10 gladly sent on request.

THE BABCOCK & WILCOX COMPANY

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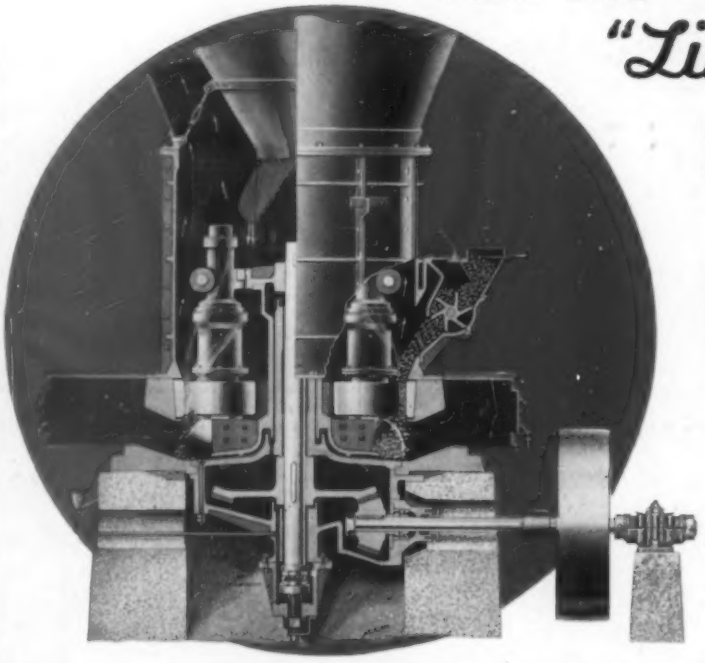
C-25

WILLIAMS FINE GRINDING EQUIPMENT

FOR THE——

"Lime Industry"



BEATER MILL WITH SPINNER SEPARATOR AND CORE THROWOUT

for HYDRATED LIME

Again in the lime field as in all others Williams equipment leads the way. The Beater Mill has many advantages for grinding hydrated lime—they include:

- A positive worm feed which never clogs.
- As the "Daddy" of the Hammer Principle Williams has brought a new and improved arrangement of hammers to the Beater Mill.
- An improved design of taking air into the mill so as to give more grinding output.
- An improved throwout for elimination of unburned cores.
- Spinner Air Separator which overcomes clogging of vanes common to old type Vane Separators—built in four standard sizes.

ROLLER MILL WITH SPINNER SEPARATOR

for BURNED LIME • • • finenesses up to 325 mesh

For handling limestone, burned lime and similar materials, Williams Roller Mills have many improvements and can be furnished with either Vane or Spinner type Air separators. The Super Separator (vane type) is instantly changeable from a fineness of 70% passing 100 mesh to 99.99% passing 325 mesh.

Features Include:

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- Steel instead of cast Iron at important points
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- Heavier and more durable construction
- Unusually low upkeep expense
- Nine Standard sizes

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Williams

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For Tough Rock Jobs
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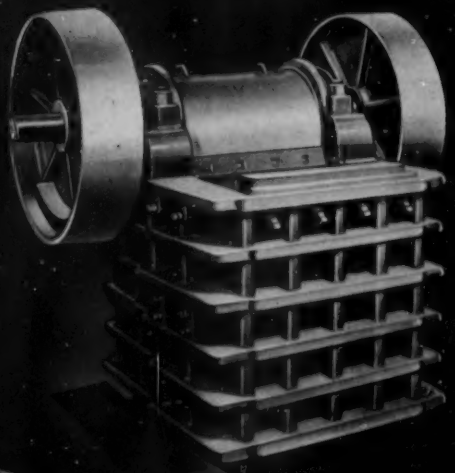

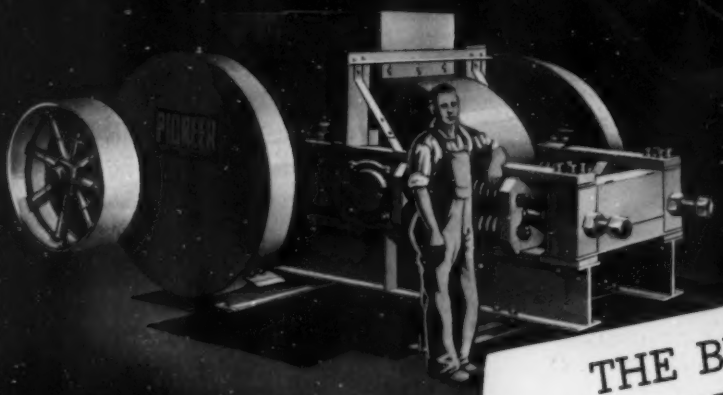

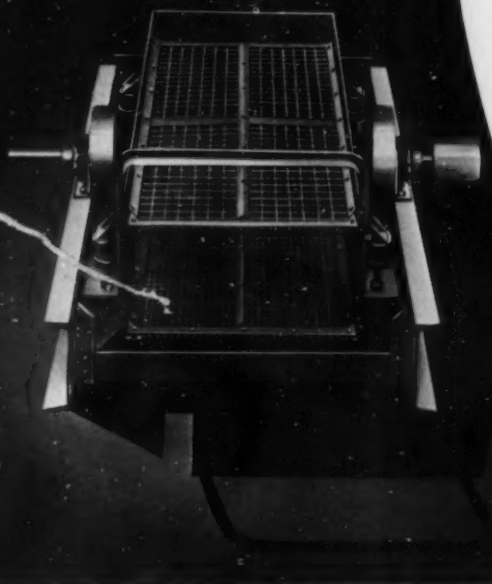

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You want big crushers that will take the rock as it comes — husky crushers that don't have to be babied — and a screen that will separate all of the crusher product accurately and without slough over.

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A heavy duty vibrating screen 4' wide and 12' long, equipped with two, three or four decks, depending on your requirements.

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With which has been consolidated the journals

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CONCRETE PRODUCTS — Est. 1918

Recognized the World Over as the Leader in Its Field

VOL. 42 CHICAGO, FEBRUARY, 1939 No. 2

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NATHAN C. ROCKWOOD
Editor

RALPH S. TORGERSON
Managing Editor

BROR NORDBERG
Associate Editor

FRANK RICHTER
Assistant Editor

CONTRIBUTING EDITORS

VICTOR J. AZBE
St. Louis, Mo.

DR. F. O. ANDEREGG
Newark, Ohio

GEO. D. ROALFE
Los Angeles, Calif.

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TELEPHONE—CENTRAL 0670

GEORGE C. WILLIAMS, *General Manager*

RALPH G. WHITE, *Advertising Manager*

L. V. RODDA, *Circulation Manager*

ADVERTISING REPRESENTATIVES

George M. Earnshaw, Eastern Manager,
522 Fifth Ave., New York City
Tel. Vanderbilt 3-7333

Richard M. Ward
2123 East 9th St., Cleveland, Ohio
Tel. Main 9645

Louis C. Thaon, Western Representative
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LONDON OFFICE

DONALD F. HUNTER, *Manager*,
2, 3, 4 Cockspur St., S.W. 1, England

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Authentic facts relating to editorial scope and readership analysis

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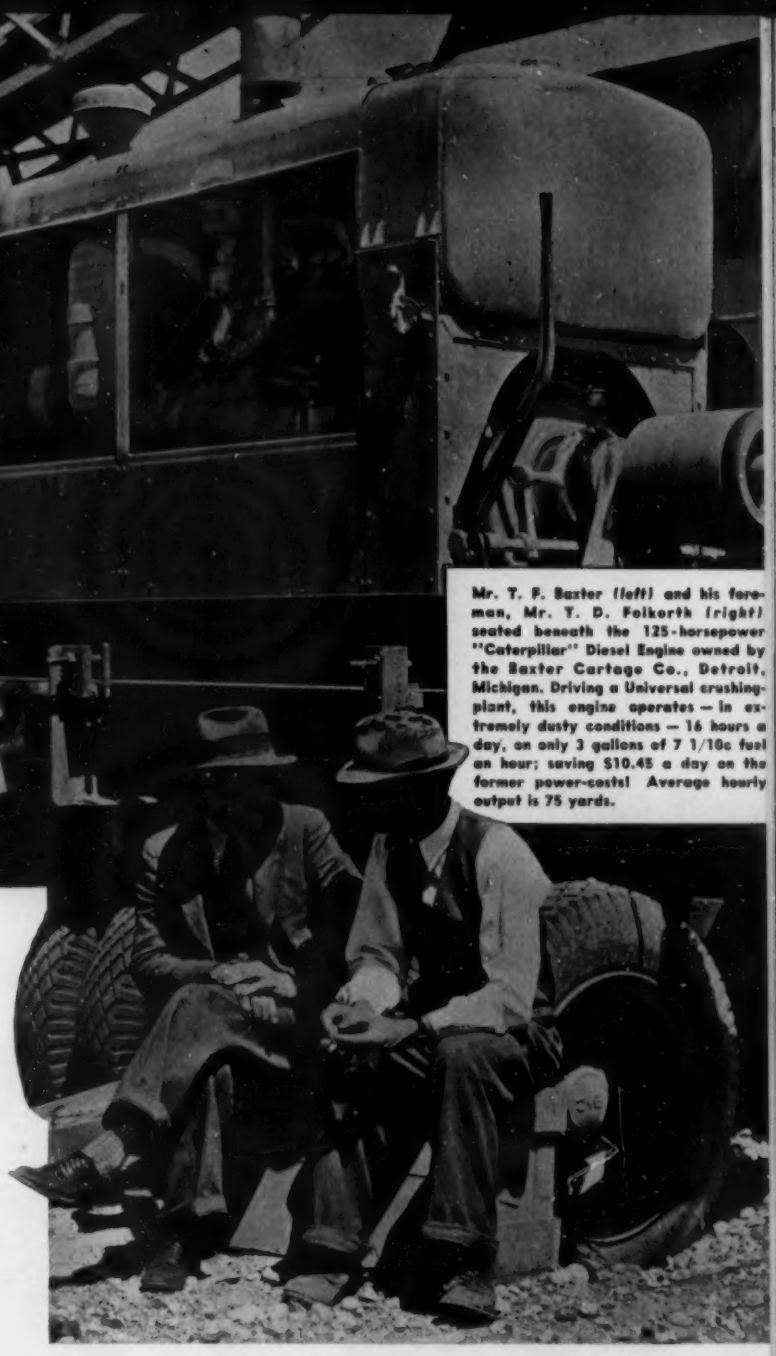
"THERE IS NO FINER EQUIPMENT THAN 'CATERPILLAR'"



Mr. T. F. Baxter *(left)* and his foreman, Mr. T. D. Folkerth *(right)* seated beneath the 125-horsepower "Caterpillar" Diesel Engine owned by the Baxter Cartage Co., Detroit, Michigan. Driving a Universal crushing-plant, this engine operates — in extremely dusty conditions — 16 hours a day, on only 3 gallons of 7 1/10c fuel an hour; saving $10.45 a day on the former power-costs! Average hourly output is 75 yards.

BACK IN 1927, Theodore Baxter bought two "Caterpillar" track-type Tractors for his first road-job in Michigan. "They were well-built machines," Mr. Baxter says, "and gave remarkable service." As a matter of fact, to show you how highly Mr. Baxter regarded those machines, he later bought two "Caterpillar" Diesel D8 Tractors . . . and, just recently, purchased a 125-horsepower "Caterpillar" Diesel Engine to operate his crushing-plant.

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Mr. Baxter comments: "I do not think there is any finer equipment built than 'Caterpillar.' It provides everything I want — including real service, when and where I want it. To me, it has meant easier profits."

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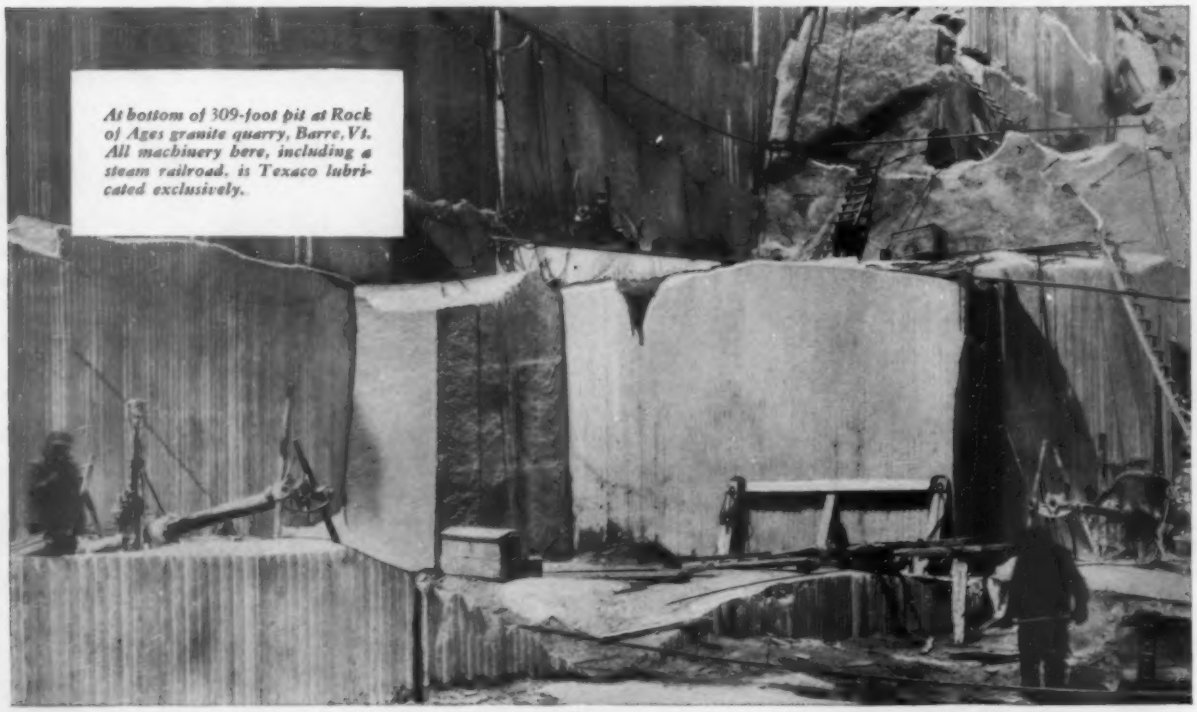
MONUMENTAL GRANITE QUARRY



At bottom of 309-foot pit at Rock of Ages granite quarry, Barre, Vt. All machinery here, including a steam railroad, is Texaco lubricated exclusively.

More than 70 air tools are chipping their way into deep granite here. Tough service, but Texaco helps to keep them on the job.

One of the I-R Air Compressors which have a capacity of 9,000 cu. ft. a minute. All are Texaco lubricated.

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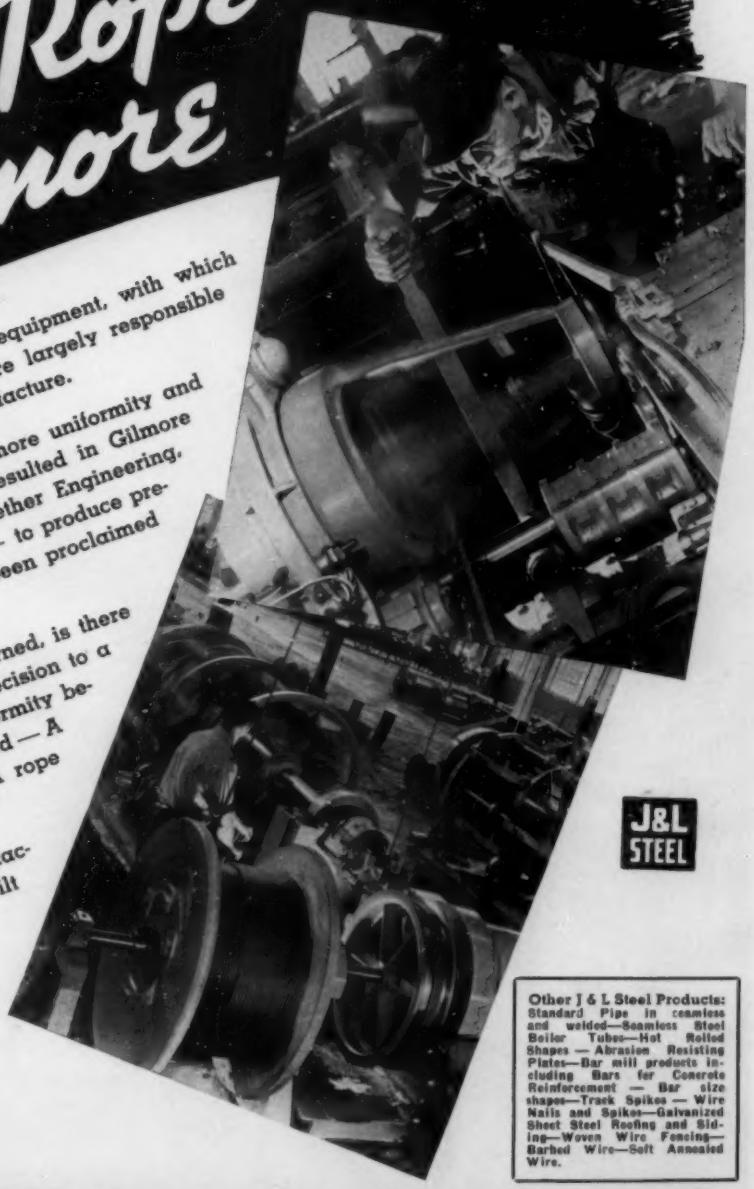
This Precision in Wire Rope costs no more



You manufacturers and users of fine equipment, with which Wire Rope plays an important part, are largely responsible for this innovation in Wire Rope manufacture.

Your demands for greater precision — more uniformity and a nearer approach to perfection has resulted in Gilmore Precisionbilt Ropes. It has brought together Engineering, Mechanical and Metallurgical Science — to produce precision fabricating machines that have been proclaimed an outstanding achievement.

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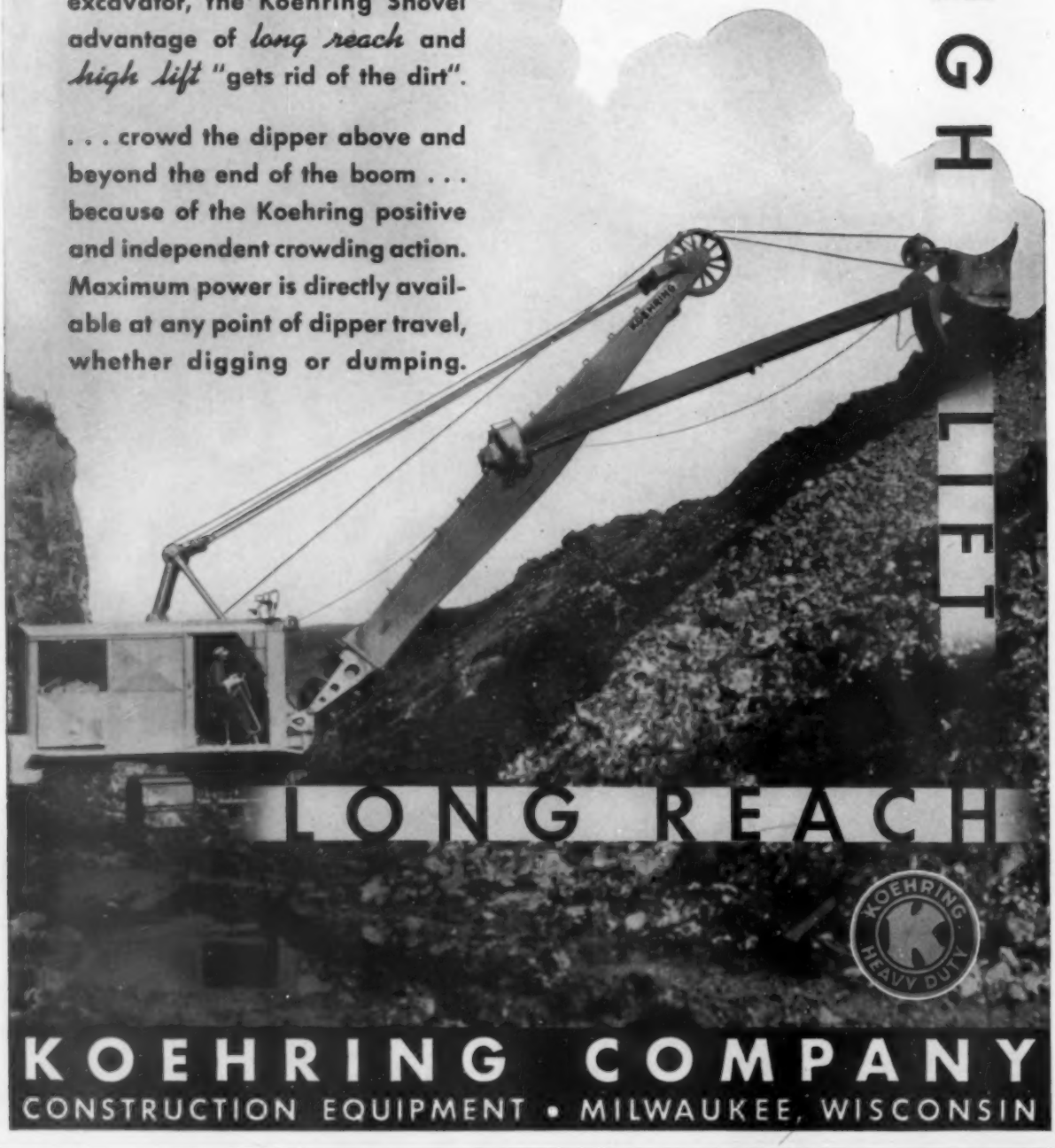

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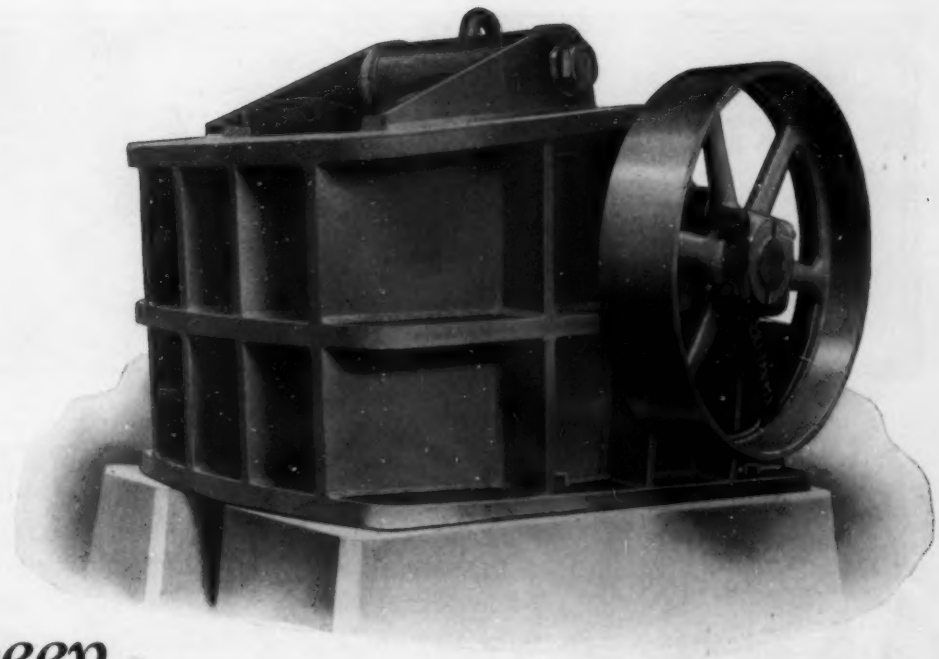

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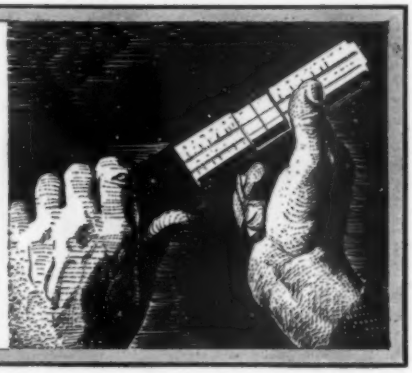

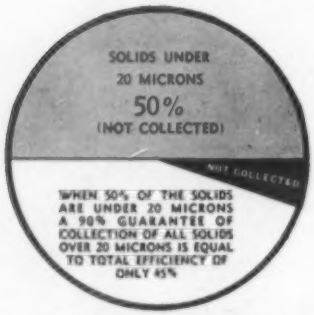
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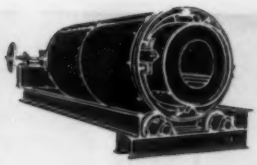

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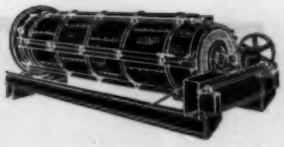

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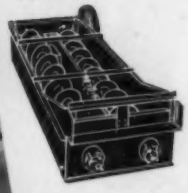

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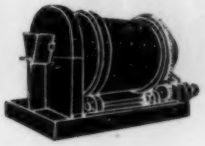

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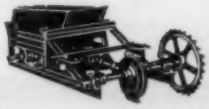

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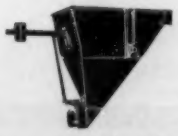

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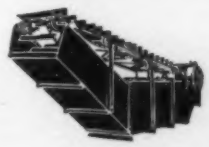

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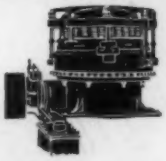
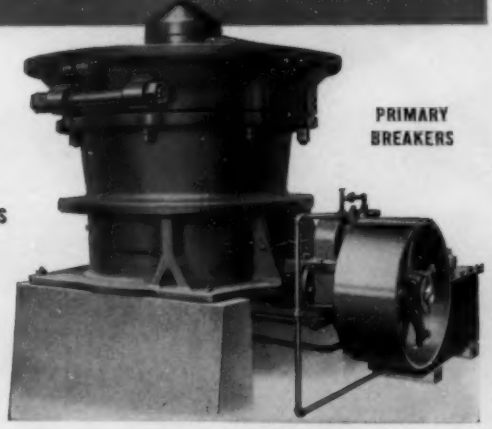


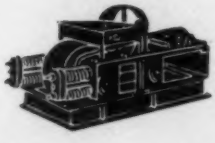
GYRASPHERE CRUSHERS

WHEELING JAW CRUSHERS

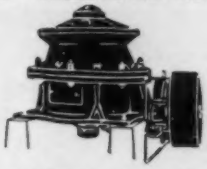


PRIMARY BREAKERS

ROTARY GRIZZLIES

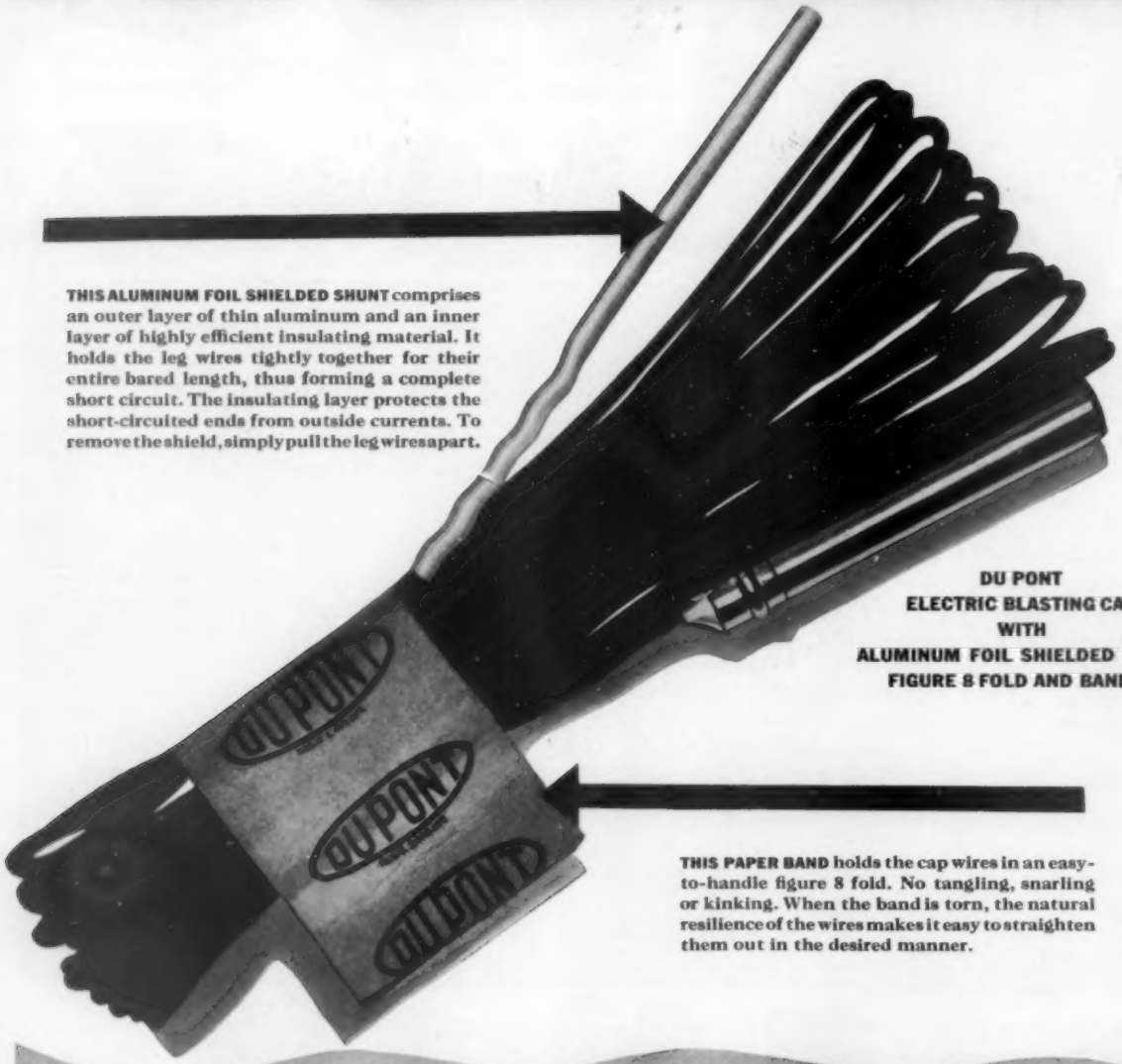


DOUBLE ROLL CRUSHERS



REDUCTION CRUSHERS

DEPENDABLE



THIS ALUMINUM FOIL SHIELDED SHUNT comprises an outer layer of thin aluminum and an inner layer of highly efficient insulating material. It holds the leg wires tightly together for their entire bared length, thus forming a complete short circuit. The insulating layer protects the short-circuited ends from outside currents. To remove the shield, simply pull the leg wires apart.

DU PONT
ELECTRIC BLASTING CAP
WITH
ALUMINUM FOIL SHIELDED SHUNT
FIGURE 8 FOLD AND BANDED

THIS PAPER BAND holds the cap wires in an easy-to-handle figure 8 fold. No tangling, snarling or kinking. When the band is torn, the natural resilience of the wires makes it easy to straighten them out in the desired manner.

DON'T RUN THE RISK OF PREMATURES. REMEMBER—THE

DUPONT REG. U. S. PAT. OFF. **EXPLOSIVES** *and*

DETONATORS

Another improvement in Du Pont Electric Blasting Caps

New Aluminum Foil

SHIELDED SHUNT

Gives double protection

DU PONT now offers *double protection* against stray currents on all electric firing devices—electric blasting caps, delays, delay igniters, squibs and delay squibs.

The new Aluminum Foil Shielded Shunt affords a short circuit of the leg wires and also shields the short-circuited leg wires from contact with possible stray currents.

Electrical tests have proved that this Aluminum Foil Shielded Shunt gives greater protection to the blaster than any short circuit heretofore offered to the user.

The Aluminum Foil Shielded Shunt can also be used with far less delay—no lost time in untwisting or straightening of leg wires before connecting up.

* * *

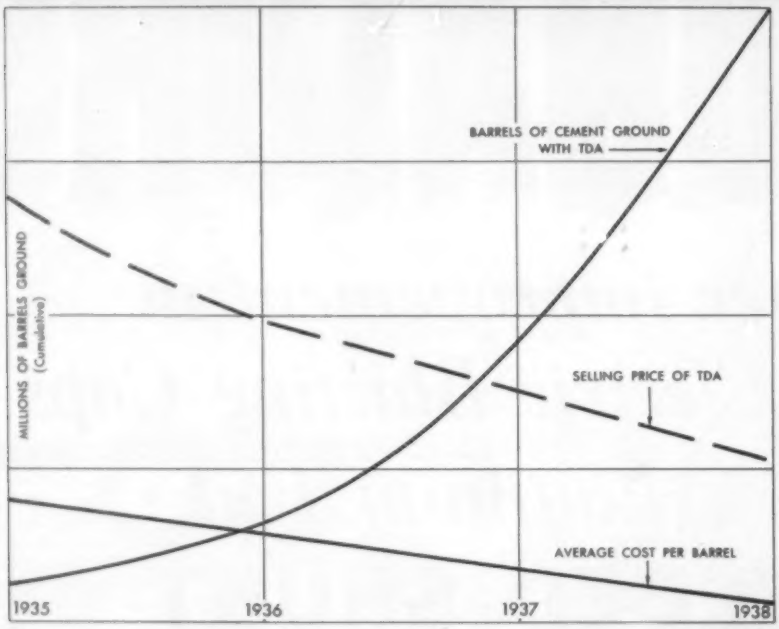
The new Aluminum Foil Shielded Shunt is "standard equipment" on all Du Pont electric firing devices for underground use. You may also have it at no extra cost on electric detonators for use above ground by specifying Aluminum Foil Shielded Shunt.

E. I. DU PONT DE NEMOURS & CO., INC.

Explosives Department Wilmington, Delaware

MOST DEPENDABLE DETONATOR IS THE SAFEST DETONATOR

BLASTING ACCESSORIES



PROGRESS REPORT ON TDA

AT the beginning of a new season, we are glad to submit to you a report on the status of TDA. This graphical presentation shows the portland cement industry's increasing acceptance of the advantages of TDA, the CATALYTIC AND DISPERSING GRINDING AID. More and more cement manufacturers are taking advantage of TDA to facilitate their production problems.

We in turn have kept faith with the industry by passing on to the users of TDA the continuing decrease in price made possible by volume production and technological improvements in manufacture.

We welcome your inquiries on TDA, its properties and how it can benefit you. Write to the Dewey and Almy Chemical Company, Cambridge B, Massachusetts.

What is TDA

TDA is a mixture of triethanolamine salts and highly purified soluble calcium salts of modified lignin sulfonic acid. TDA is an excellent grinding aid. Its presence improves many of the important properties of concrete such as durability, strength, and permeability.

DEWEY and ALMY CHEMICAL CO.
CAMBRIDGE
MASS.

TDA

LONDON MELBOURNE OAKLAND MONTREAL

JAEGERS GIVE YOU *a recognized advantage*

. . . . a Higher Strength, More Workable Concrete, Preferred by Engineers and Contractors . . .

Plus the Most Efficient, Low Cost Mechanism Yet Developed for Transit Mixing and Delivery . .

More concrete is sold by Jaeger Truck Mixers than by any other method—now exceeding $30,000,000 worth per year —and the demand KEEPS ON GROWING.

Here is one business that offers opportunity — to make a better profit than you could ever earn by selling bulk materials, to expand your present sales of "ready-mixed," or to establish a new business with the advantage of known quality in your product and greater efficiency in your operating equipment.

Write today for our new Specification TM-39, giving data of essential importance to present and prospective operators of ready-mix plants.

THE JAEGER MACHINE COMPANY
603 Dublin Avenue Columbus, Ohio

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PRODUCERS OF CRUSHED MATERIALS THE WORLD OVER CANNOT BE WRONG

SYMONS CONE CRUSHERS

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Can YOU Approach this Trailer TONNAGE ?

2700 Tons Hauled and Discharged in 7 hours with only FOUR 16-Ton (WATER LEVEL) S-D Automatic Bottom Discharge Trailers

This is the actual result of one company using S-D Automatic Trailers . . . the simplest, fastest, most foolproof and economical trailer you can buy.

Are you operating full capacity? If not, isn't it even more important to save every dollar possible. Short operating schedules demand maximum production, minimum loss of time, and rock bottom maintenance cost.

Here is the trailer that eliminates all auxiliary powered dumping mechanisms—Result: simplicity and low upkeep expense! Sanford-Day's nationally known rail car principle of automatic bottom discharge is the feature of this trailer. Doors are tripped and closed automatically by the simple forward movement of the trailer. No manual labor whatsoever. With a continuous circuit of hauling—never stopping when discharging . . . with the maximum capacity available for given over-all dimensions . . . with doors swinging below top of bin when in discharge position, permitting a very low center of gravity and extreme low over-all height, S-D Automatic Bottom Discharge Trailers will save time . . . at production speeds you never thought possible. Built for Strip Mines, Cement, Sand, Gravel, and other operations, in capacities to suit your individual requirements. Clip the convenient memo at right and mail NOW.

MAIL THIS MEMO NOW—

Sanford-Day Iron Wks., Knoxville, Tenn.

Furnish us with your completely illustrated "Increase Production—Lower Cost" story on the S-D Automatic Bottom Discharge Trailer.

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Address_____

City_____ State_____

By_____ Title_____

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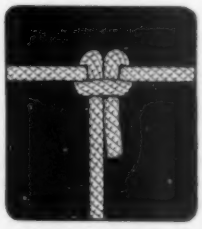
700 Dale Ave., Knoxville, Tenn., U.S.A.

MINE CARS, ALL TYPES • TRAILERS • WHEELS • SHEAVES

Lighter Weight for Easier Handling

Light, flexible and remarkably strong—the new Primacord-Bickford Detonating Fuse is easy to handle and hook up. It saves time on every job without sacrifice of safety, dependability and effectiveness. There's a saving on transportation charges, too, since the gross shipping weight of 1000 feet of plain Primacord on its wooden spool is only 20 pounds —500 feet only 11 pounds.

The Primacord Booklet gives you complete information on this new detonating fuse and its profitable use. Send for free copy today.



THE ENSIGN-BICKFORD CO., SIMSBURY, CONN., U. S. A.
Makers of Cordeau-Bickford Detonating Fuse—and Safety Fuse Since 1836

PRIMACORD-BICKFORD *Detonating Fuse*

PBS

CONTRACTS ARE BEING AWARDED

ON THE STRENGTH OF NEW EQUIPMENT.

MODERNIZE with MARIONS FROM 3/4 CU. YARDS UP

FAST

BASE YOUR BIDS ON THE GREATER YARDAGE and LOW OPERATING COST of THE NEW

MARION

STURDY

BOOM-Sturdily constructed of steel to withstand all stresses incident to heavy digging.

CAB-Full vision with many comforts and conveniences for the operator as a safeguard against fatigue.

UPPER FRAME AND OPERATING MACHINERY-Upper frame is a firm, solid foundation designed for maximum strength and lowest possible weight. The operating machinery is compactly arranged for ready accessibility, ease of maintenance and operation.

CONTROLS-All centrally located at operator's station. Starting, controlling and indicating devices within easy reach and sight of operator. Simplified manipulation of levers and foot pedals.

LOWER FRAME-Sturdily constructed for strength; long and wide base for stability.

CRAWLERS-Positively will not clog in any material . . . nor bind in traveling over uneven surfaces.

ANTI-FRICTION BEARINGS-At all strategic points to reduce wear to a minimum. Propelling gears sealed against dirt and operate continuously in oil.

There is a Marion excavator of the right size, type and capacity . . . from ¾ cubic yard up . . . to speed up the work on any material handling job . . . powered with either gas, Diesel, electric, gas-electric or Diesel-electric. Have our excavating engineers study your material handling requirements and make a recommendation.

THE MARION STEAM SHOVEL COMPANY • MARION, OHIO, U. S. A.

Write for bulletins of the Marion excavators in which you are particularly interested. Give size. Marion would also like to send you THE GROUND-HOG regularly with its compliments.

CRANES • DRAGLINES
SHOVELS • CLAMSHELLS
PULL SHOVELS

VERSATILE

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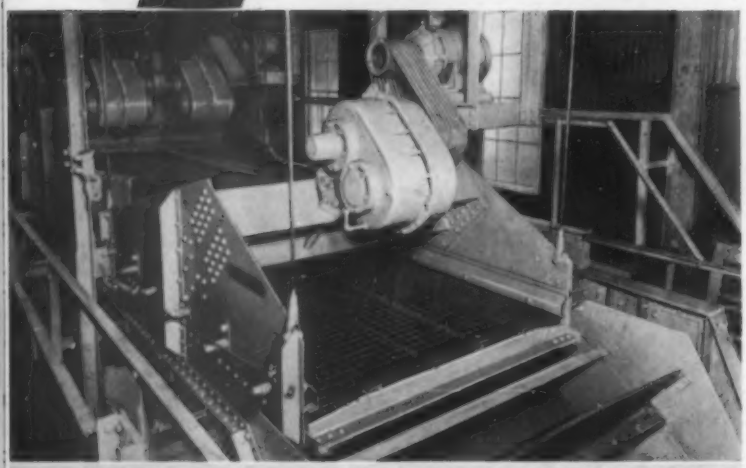
Here's How You Can Turn Out a Better Product . . . Cut Power and Maintenance Costs . . . Save Time and Space!

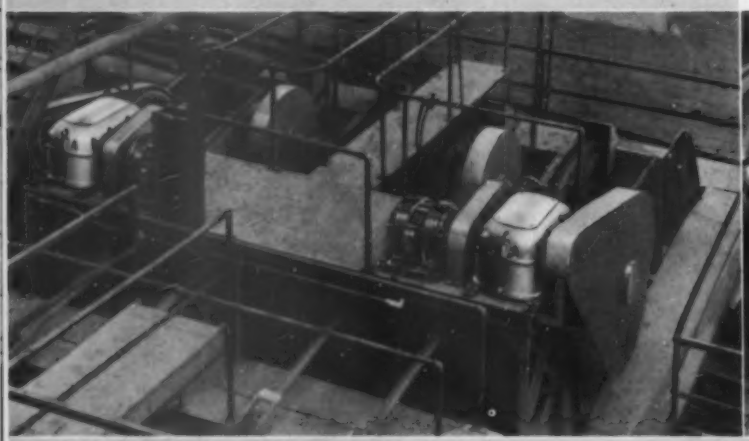


CLEANER SEPARATIONS, reduced space requirements, lower operating costs . . . all are features of Allis-Chalmers screens. These two Low Head Vibrating Screens, driven by Lo-Maintenance Motors and Texrope Drives, are cutting costs in a Wisconsin plant.

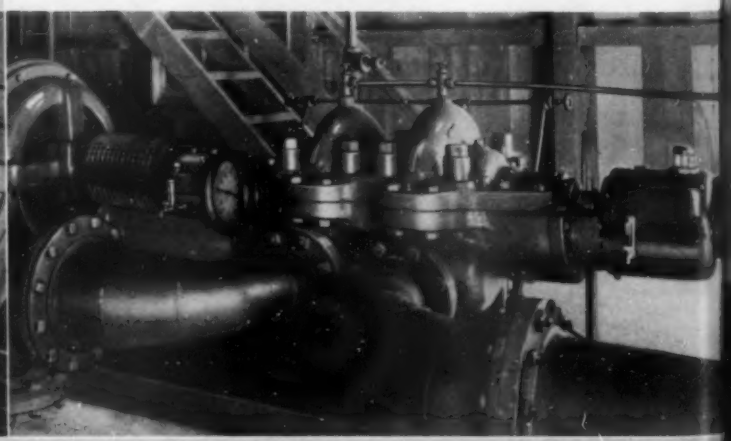
Replace Worn Out, Obsolete, or Ineffective Equipment with the Modern Allis-Chalmers Line of Crushing Equipment that Pays for Itself!

If you find that you're having a tough time meeting specifications . . . if your maintenance and power costs are rising too high . . . if your different operations aren't coordinated . . . then you, as a progressive operator, know that it's time to modernize!

And . . . if you want to place the entire responsibility for mechanical operation in the hands



LOW-COST VARIABLE SPEED transmission is delivered by Allis-Chalmers Vari-Pitch Speed Changers. Shown are two of these sensational new machines operating classifiers.



HIGHER CAPACITY at lower cost is delivered by this 1250 gpm Multi-stage Sluicing Pump and Lo-Maintenance Motor in a midwestern sand and gravel plant.

PROFIT LEAKS!

of one company . . . to insure uniformly high performance at low maintenance costs . . . the best investment you can make is to get in touch with Allis-Chalmers . . . to find out about the famous line of equipment that pays for itself!

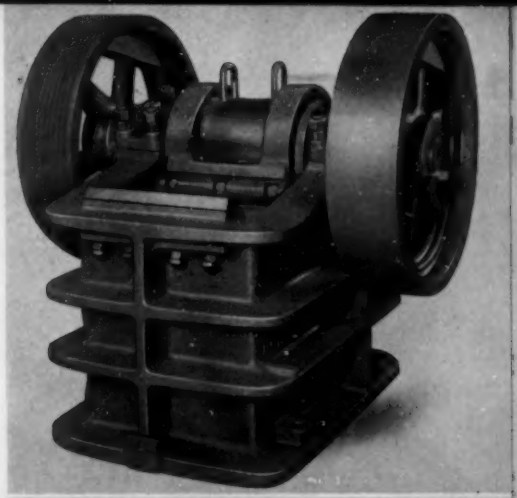
For Allis-Chalmers, backed by over 90 years' experience of serving industry, makes a complete line of crushers, screens, grizzlies, hoists, elevators, feeders, washers, dryers, pumps, motors, and Texrope Drives. And each of these products works to cut your costs just as it has in thousands of installations all over the world. You get increased production in the sizes you need!

Learn What Allis-Chalmers Can Do For You!

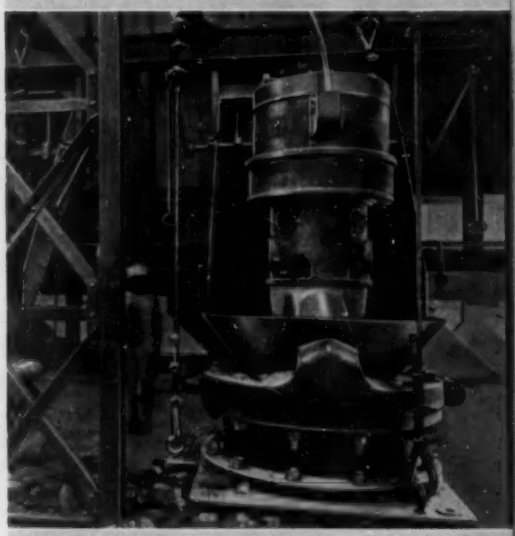
But you get more than that! When you place an order with Allis-Chalmers, you get all the benefits of undivided responsibility for mechanical operation. Trained engineers are available to our customers from the time plans are started until your plant is actually operating.

Get all the facts! Contact your nearest Allis-Chalmers District Office or write direct to Allis-Chalmers, Milwaukee . . . and learn how you can go after that extra business by plugging profit leaks! You'll find that it's profitable to modernize with the Allis-Chalmers line of crushing plant equipment that pays for itself!

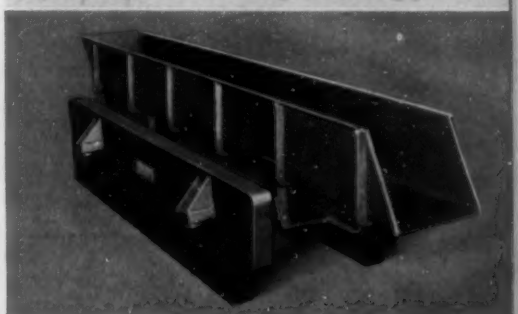
1036



CAST STEEL FRAME and swing jaw make this Fine Reduction Crusher among the sturdiest on the market today. This unit is arranged for Texrope Drive, guaranteeing a high overall efficiency.



UNIFORM SIZES are delivered by this Newhouse Gyratory Crusher at low operating costs in a large crushing plant.



SIMPLE AND STURDY, this Electro-Magnetic Vibrating Feeder cuts maintenance costs in the handling of any material which must be fed at a uniform rate.

CRUSHING CEMENT AND MINING DIVISION

ALLIS-CHALMERS

MILWAUKEE·WISCONSIN

ALLIS-CHALMERS A-C MILWAUKEE

Forward Steps to Greater Safety in Electric Blasting Caps

Atlas Manasite. For greater safety, Atlas Manasite gives full detonating efficiency with reduced sensitivity to impact and friction. This lessens chance of accident through inadvertent mishandling.

Atlas Insulated "Match-Head." For greater safety, the Atlas Match-Head Electric Blasting Cap provides accurate, reliable firing and positive insulation of the firing device from the copper shell.

Atlas Safety Shunt. For greater safety, Atlas Metal Safety Shunts protect against accidental firing by short-circuiting the leg wires.

Atlas Accordion Fold. For greater safety, this convenient tube encloses many folds of wire to protect the detonator.

When you review the history of electric blasting cap progress, you can't escape the conviction that Atlas improvements have been high spots in leading the advance toward greater safety and more effective detonating methods. "Atlas Firsts"—the Match-Head, the Safety Shunt, the Accordion Fold, and Atlas Manasite—each has given greater effectiveness to safety precautions. Each has contributed to efficient and economical blasting. Ask your Atlas representative.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

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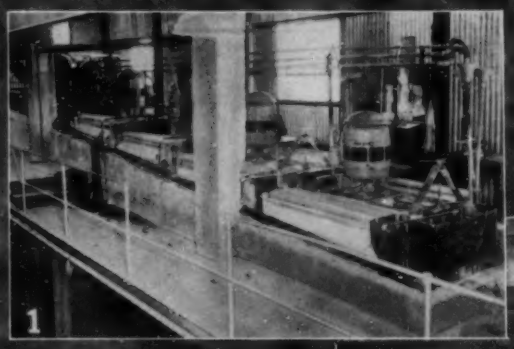
ATLAS

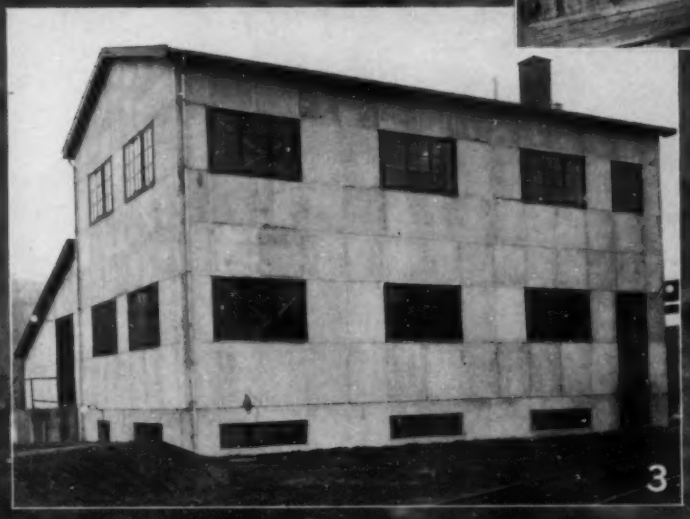
EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

THE FLOTATION PROCESS in the CEMENT INDUSTRY

FLS





has for its object the improvement of inferior cement raw materials by removing the undesired quantities of minerals, making it possible to produce high quality cement from low-grade rock.

Cement raw materials from all parts of the world and of almost every type have been tested in our laboratories to determine process and reagents. Based on continuous tests on a semi-large scale in our pilot plant in Copenhagen, we have designed installations and determined operation costs for the introduction of the flotation process at several works. Of these, two are operating (Finland and South Africa) and another is being erected in South Africa.

For the whole world, with the exception of the United States, Canada and Mexico, we control all patent rights and are supplying machinery for the application of flotation in the cement and allied industries.

Fig. No. 1—Flotation plant, South Africa
Fig. No. 2—Flotation plant, Finland
Fig. No. 3—Flotation Laboratory and Pilot plant, Copenhagen

F. L. SMIDTH & CO. A/S

33, VESTERGADE. COPENHAGEN, DENMARK

All patent rights in North America are controlled by Separation Process Company, Catasauqua, Pa.

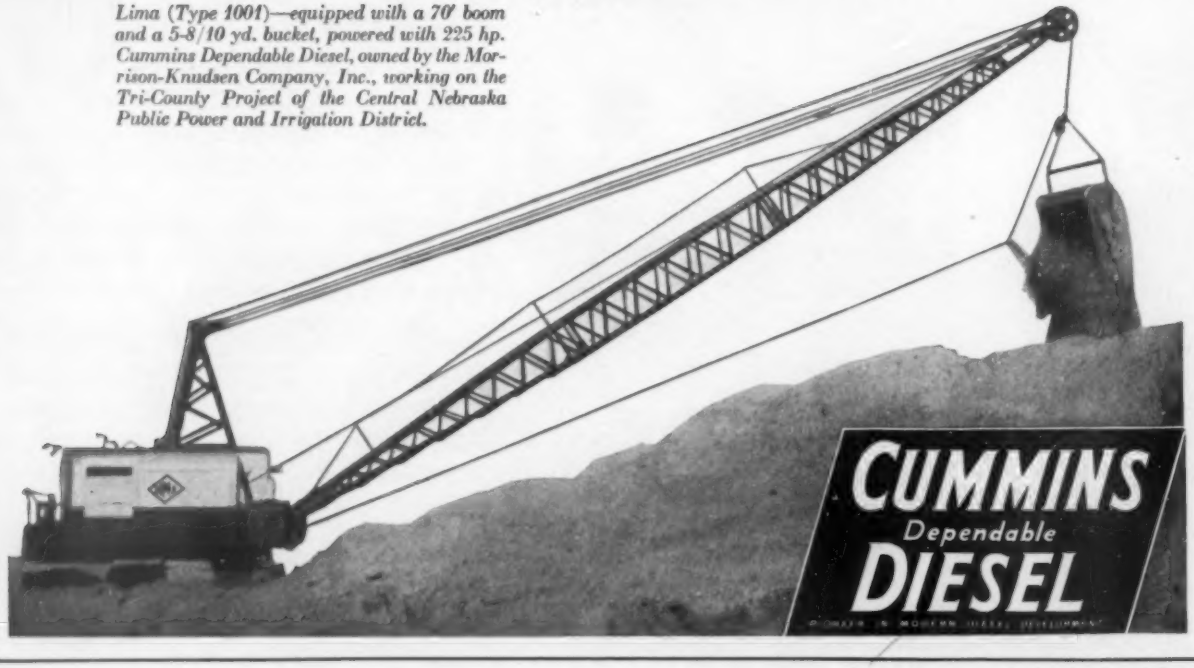
No Three-Cornered Service Problem when you buy CUMMINS dependable Diesel

Whether you buy new equipment powered with Cummins Diesels or re-power your old, you are assured the backing of a national service organization.

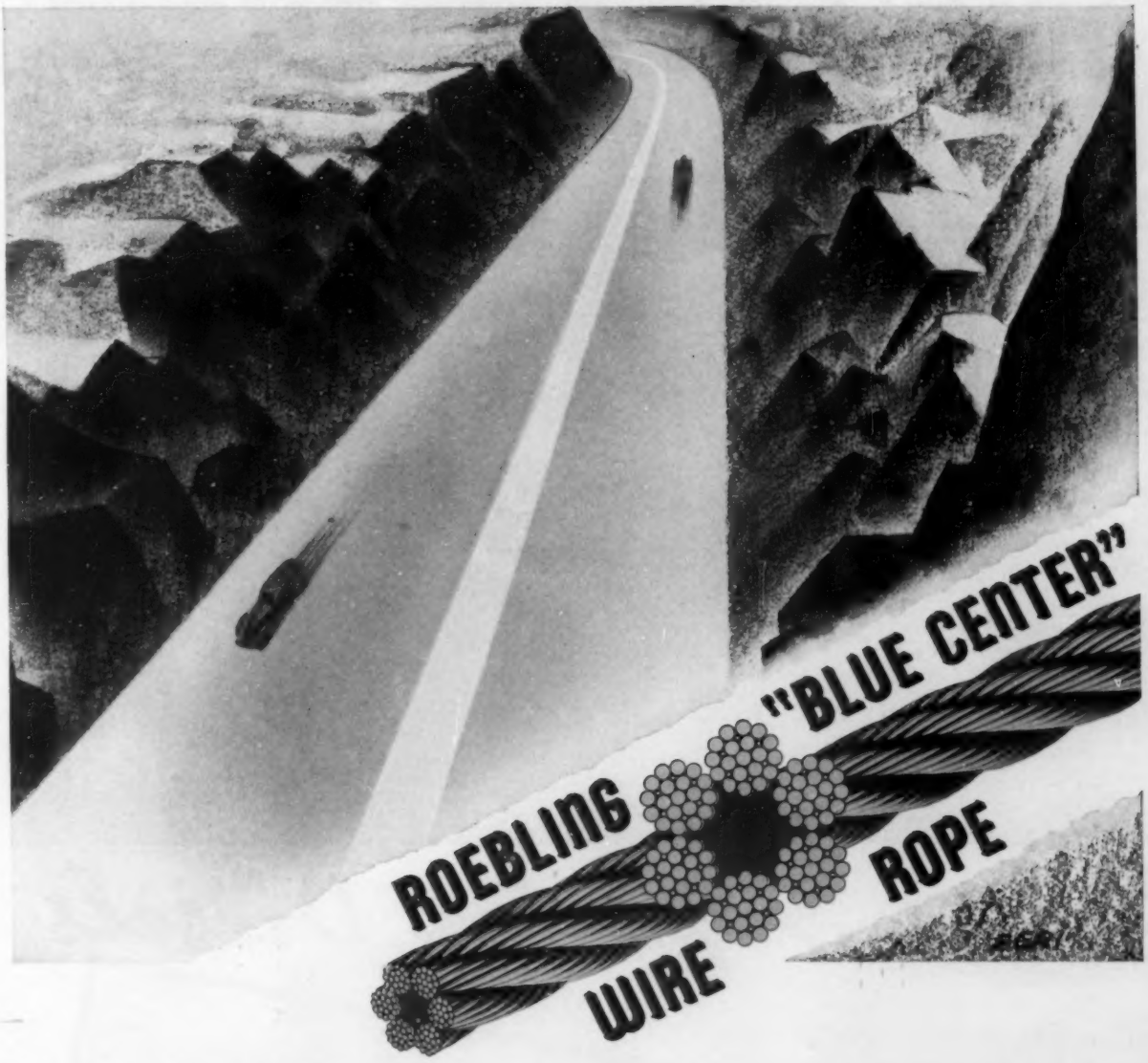
The responsibility for servicing your Cummins Diesel is in the hands of a crew of factory-trained service men and your local Cummins representative—no matter from whom you may have bought your equipment.

This means no divided responsibility—no question whom to call—should accident or emergency demand instant attention. Cummins Engine Company, 3816 Wilson Street, Columbus, Indiana.

Lima (Type 1001)—equipped with a 70' boom and a 5-8/10 yd. bucket, powered with 225 hp. Cummins Dependable Diesel, owned by the Morrison-Knudsen Company, Inc., working on the Tri-County Project of the Central Nebraska Public Power and Irrigation District.



OPENING NEW ROADS TO ECONOMY



Try "Blue Center"... and see what it means in the way of safe, saving service! Into this rope Roebling has put its utmost steel making and rope fabricating ability!

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N.J.
BRANCHES IN PRINCIPAL CITIES

STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

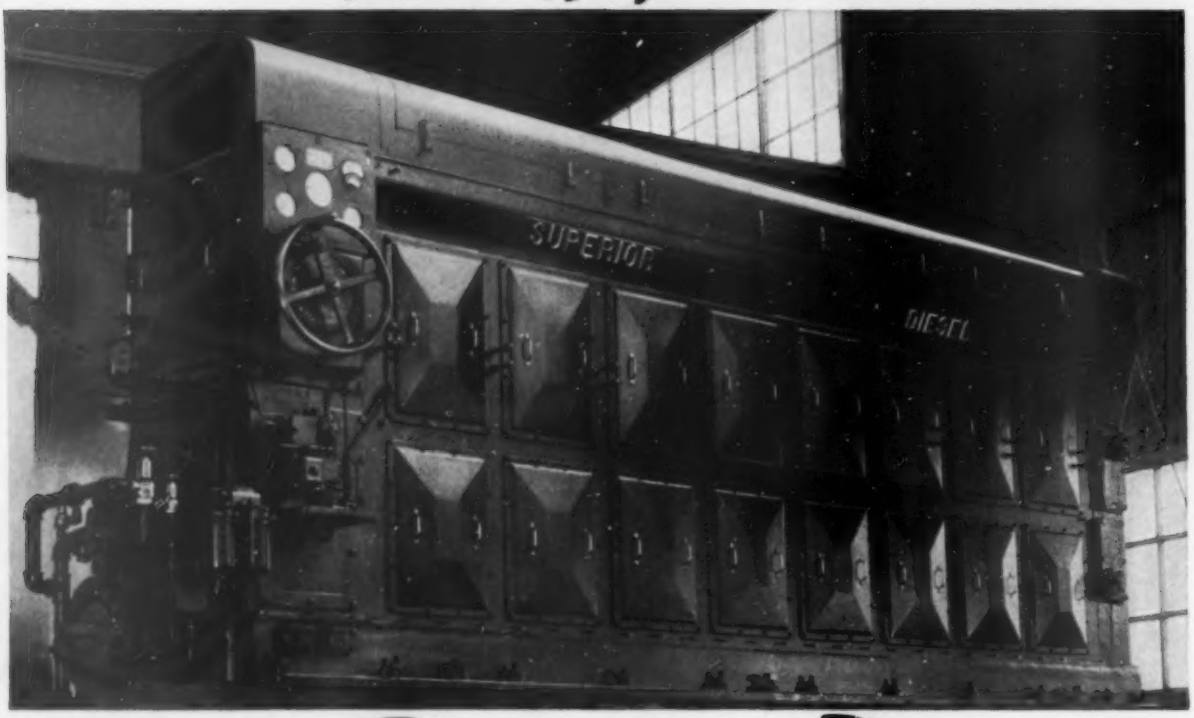
SAFER—Unequalled for uniformity of quality

SAVING—Insures lowest general average operating cost

THE HIGHEST DEVELOPMENT IN ROEBLING WIRE ROPE

FOR A QUICK GET AWAY

. . . From High Cost Power



Use Superior Diesels

Use Superior Diesels—one of the soundest self-liquidating investments for the average power user.

Apply them with common sense and good engineering principles and watch your power cost DROP to 1c per KWH or less.

Superior DIESELS

HEAVY DUTY MODELS:
50 to 810 H. P.,
250 to 720 R. P. M.

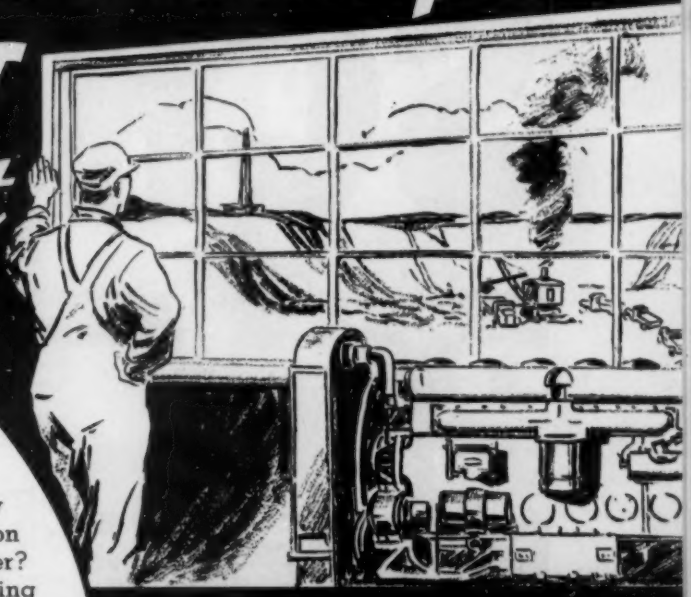
HIGH SPEED MODELS:
15 to 230 H. P.,
900 to 1800 R. P. M.

THE NATIONAL SUPPLY COMPANY — SUPERIOR ENGINE DIVISION

FACTORIES: Springfield, Ohio; Philadelphia, Pa. · SALES OFFICES: Springfield, Ohio; Philadelphia, Pa.; New York, N. Y.; Los Angeles, Calif; Houston, Texas.

MODERN POWER *in the plant—*

but the HIGH COST of STEAM in the pit



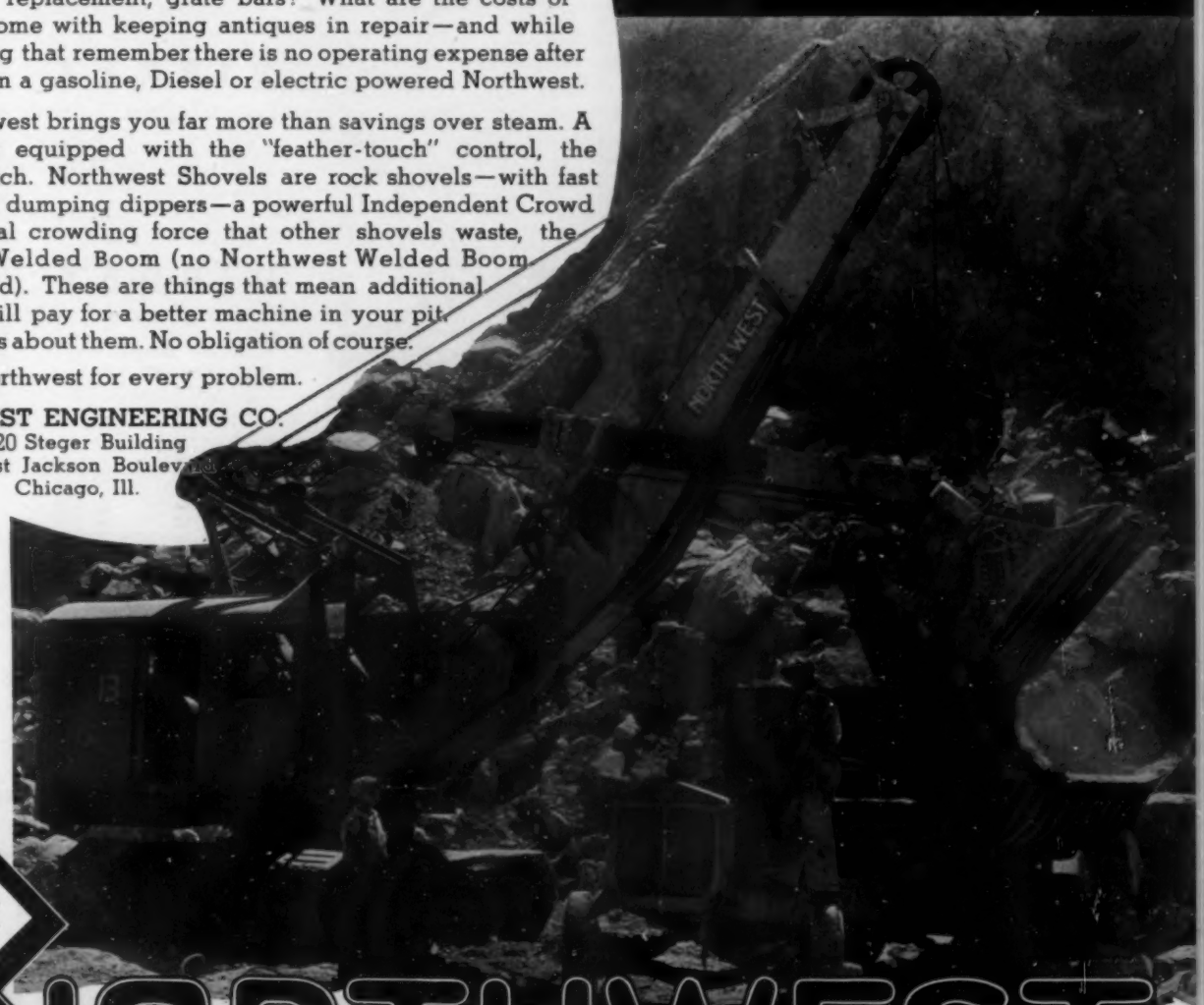
WHY is it that so many quarry and gravel plant operators have taken care to install the most modern power possible in the plant but continue to burn up money in an ancient shovel in the pit?

Because a machine doesn't owe you anything on the original investment doesn't necessarily mean it earns as much money as a modern unit. If you are operating a steamer, check up on it for yourself. What does it cost you to haul coal and water? What's the expense of a watchman, drawing fires, blowing down, boiler replacement, grate bars? What are the costs of delays that come with keeping antiques in repair—and while you're figuring that remember there is no operating expense after you shut down a gasoline, Diesel or electric powered Northwest.

And a Northwest brings you far more than savings over steam. A Northwest is equipped with the "feather-touch" control, the Cushion Clutch. Northwest Shovels are rock shovels—with fast filling, quick dumping dippers—a powerful Independent Crowd and additional crowding force that other shovels waste, the *Northwest* Welded Boom (no Northwest Welded Boom has ever failed). These are things that mean additional profits that will pay for a better machine in your pit. Ask for details about them. No obligation of course.

There is a Northwest for every problem.

NORTHWEST ENGINEERING CO.
1820 Steger Building
28 East Jackson Boulevard
Chicago, Ill.

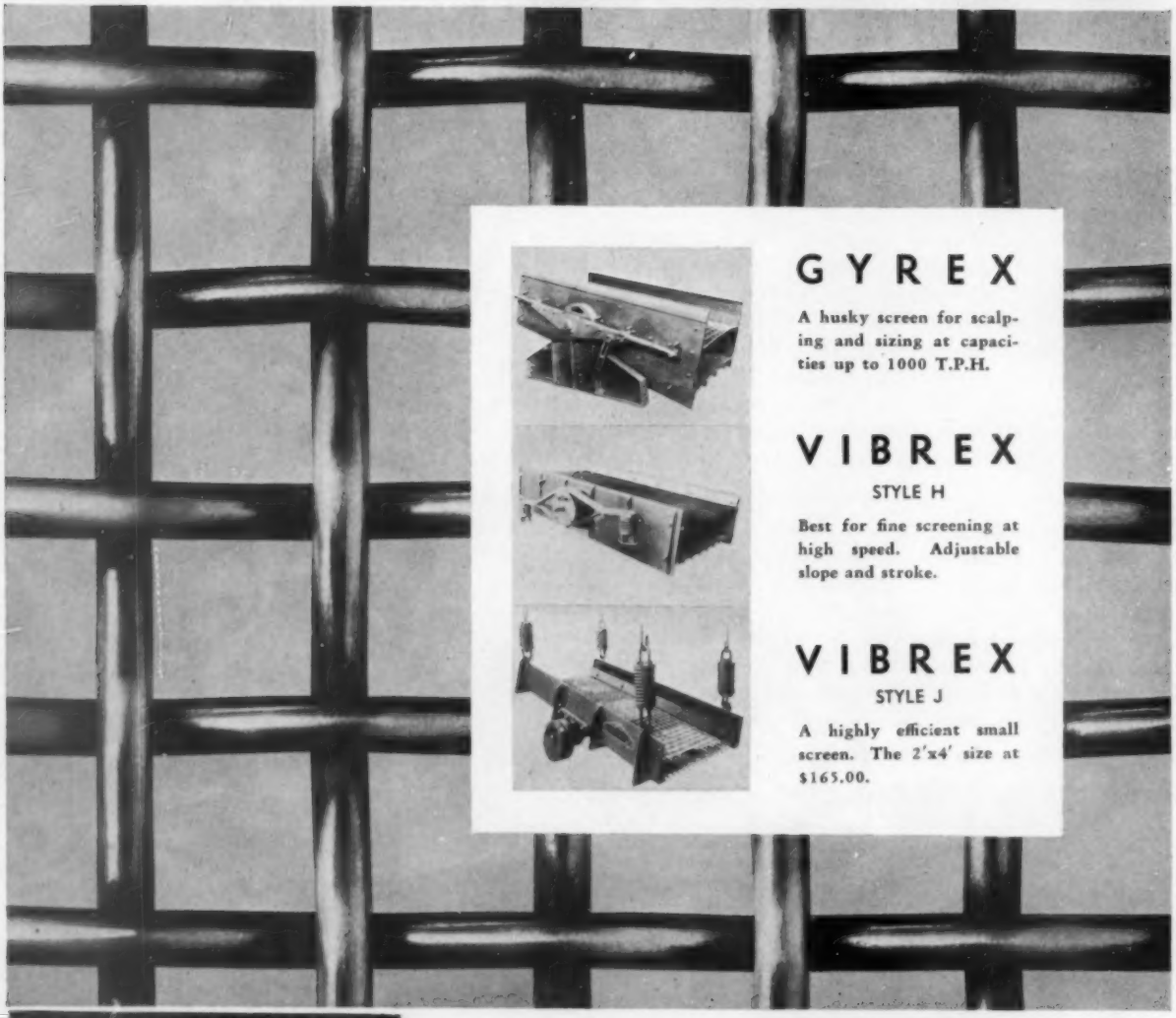


GASOLINE • ELECTRIC • DIESEL • OIL

Built in a range of 18 SIZES 3/8 yd. capacity and Larger

NORTHWEST

SCREENS



GYREX

A husky screen for scalping and sizing at capacities up to 1000 T.P.H.

VIBREX

STYLE H

Best for fine screening at high speed. Adjustable slope and stroke.

VIBREX

STYLE J

A highly efficient small screen. The 2'x4' size at $165.00.

MATERIAL HANDLING
ROBINS
EQUIPMENT

The three types of screens include more than 300 sizes and models. Experience proves that true economy in screening is obtained only when the screen used exactly fits the work to be done.

ROBINS CONVEYING BELT COMPANY, 15 Park Row, New York, N. Y.

Please send me particulars about your screens.

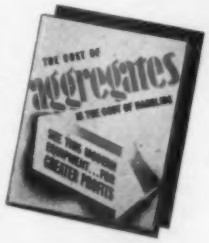
Name .....

Firm .....

Address .....

City ..... State .....

Send for the folder "AGGREGATES" showing in picture form the many items you can profitably install to lower your operating cost.



ROCK PRODUCTS

Why Not the Helping Hand?

As this is written we are about to depart on our annual convention circuit—to "cover" eight annual conventions of industries and professions comprising or related to the rock products industry. This being the twenty-second such pilgrimage, may we be pardoned for a few remarks on conventions and national associations?

The American trade association convention has become an established institution, as much a part of our business and industrial life as the "traveling salesman," or as he used to be called "the trade drummer." We suppose that every day of the year, with the possible exception of Sundays, hundreds of conventions are being held somewhere in these United States. Without them, hotels and railways would suffer a very serious cut in income. Their indirect cost to every variety of American business and industry must run into millions. Why are they?

Having witnessed the birth of several, and known most of the others in their youth, an answer readily comes. First we believe they are a necessary and legitimate expression of our sense of nationalism. National trade and industrial associations and their conventions have done as much (or more) to break down provincialism as have the railways and interstate highways. We think the main attraction to attendance at annual conventions still is the desire to get away from one's narrow business province, to where he can rub shoulders and hob nob with men from distant places who think similar thoughts and have similar problems. That, and the desire for renewal of friendships and acquaintances are powerful motives, sentimental though they may be.

To a considerable extent trade associations are for defensive purposes. Several in our industry were formed during the world war days for self preservation against federal government edict or neglect. Some were organized before that as a defense of members against one another, or against members of other organized industries. Naturally, all were organized with the intent, or at least the hope, of increasing the profits of members. Usually we say "to better business conditions in the industry." To accomplish this directly, research and subsequent promotion of the results of research, when favorable, has been a major activity. Rightfully, therefore, it receives a prominent part in the convention program.

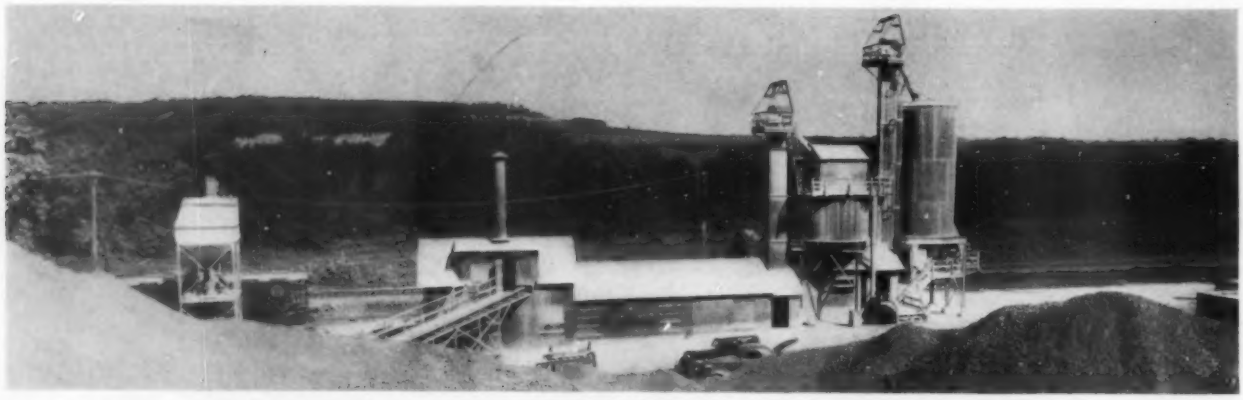
Another direct approach to greater profits is to discover ways and means of reducing costs of production. Nearly every operator, wide awake enough to belong to a national association and attend its conventions, could make some contribution. This part of the program is seldom well developed or organized. A great deal of such information comes out usually in private conversations and in informal discussions, sometimes on entirely foreign subjects. It is difficult to organize a discussion of this kind; yet most association officials desire such programs.

A third direct approach to greater profits, or in this case at least, "better business conditions," is to discuss frankly what one might term the pertinent details of a *business philosophy*. What are rules of fair buiness? What is a fair profit? On what should profits be figured—investment in the business, percentage of cost of product, percentage of labor cost, or how? What relation should my prices, if my costs are different, bear to your prices, if any, and why? How far do the rules of fair business, or business ethics, require a low cost producer to go in "holding an umbrella" over his higher cost competitors? Where is the line to be drawn, in theory at least, between public welfare and industry welfare and individual welfare? We could think of a dozen more pertinent questions, but let those serve as examples.

So far as we can see there is no law against discussing such subjects philosophically—by philosophically we mean in a scientific frame of mind seeking truthful answers. A beginning was made in N.R.A. days, but unfortunately dropped with N.R.A. This is regrettable because out of those discussions would have come enlightenment; and enlightenment is very much to be desired because the federal government has not ceased looking for answers through legislation and in the courts. Nor will this groping by government to find answers cease when and if the New Deal ceases. It did not begin with the New Deal. The other night we heard over the radio Col. Frank Knox, as spokesman for the Republican party, tell a group of farm politicians that, to win in 1940, his party must promise to suppress trade associations encouraged by the N.R.A. to increase the prices of the things the farmer buys; and it must provide to let in imports that organized industry is keeping out—this, according to Col. Knox, would permit agricultural exports and make artificial price-fixing for the farm products unnecessary.

We regret the reluctance of trade association members to discuss the philosophy of their industry, and as a result their failure to work out some fundamental principles on which their industry, and all American industry, might be conducted without so much assistance by politicians.

Nathan C. Rockwood



New agricultural stone plant at Edenburg, Penn., showing screenings in foreground with tunnel belt conveyor feed into dryer, surge bin over the pulverizing mills and the loading out bin on the right

Double Agstone Capacity

Rebuild Ballast Plant

Markets for smaller and more sizes of commercial stone and the growing importance of agricultural stone have influenced two major developments by the New Castle Lime and Stone Co., New Castle, Penn. During 1938, the company's capacity for agstone was more than doubled by the construction of a new plant at Edenburg, Penn. The railroad ballast plant at Dunbar, Penn., has been completely rebuilt—not for greater overall capacity but to produce an equal capacity in smaller stone sizes to supplement the volume ordinarily sold for ballast.

At Dunbar, a mine was opened and the first plant was built in 1929. Ballast was practically the entire output at that time. The new plant is designed to, and ordinarily does, produce about 50 percent ballast, 20 percent 1- to ¼-in. stone for highway surface treatment, 15 percent ⅝- to ⅛-in. stone for amiesite and the remainder a minus 7/32-in. product sold to concrete block plants, for amiesite and as a binder for macadam. However, the plant has sufficient reduction crushing capacity and screening surface to afford the needed flexibility to make other product variations.

No Elevators Required

Situated high in the Allegheny foothills, the plant layout fits the contour of its surroundings and presents a striking picture. The mine is a horizontal working high on a hillside, with the mine entrance above the elevation of the crusher building. This building, which houses the primary crusher, two reduction crushers and a revolving scalping screen, is on the crest of a hill sloping down to the valley floor. The screening plant is built up from the valley floor a height of 70 ft. or more, and the screening is done by passing the stone over vibrating screens on different floor levels from the top of the plant to the bottom without the use of elevators. The lower bank of screens is probably 200 ft. below the mine entrance.

"Blue rock," as the rock formation is termed, is 60 percent silicate and has the hardness to meet the specifications for trap rock ballast. The mine has a 60-ft. ceiling, and is being worked in 20-ft. benches. A 1-cu. yd. Osgood electric shovel loads the stone into hired trucks which travel a steep downgrade to the crushing plant. A 1-cu. yd. No. 1030 Bucyrus-Erie electric shovel also is available for this and other work.

The primary crusher is a 26½- x 36-in. Traylor type H Blake swing jaw crusher of all-welded steel with smooth-faced jaw plates and the reduction crushers are type TY and TZ gyratories of the same make. On the primary crusher the lower end of the swing jaw plate is concaved while the opposing lower half of the fixed jaw plate is convexed.

Discharge from the primary breaker is put through a 5- x 16-ft. Allis-Chalmers revolving screen, and plus 2⅛-in. stone is scalped out and put through

Left: All crushing is done in building to the right; all screening in building on valley floor. Right: Belt conveyor over which stone is passed from the crushing to the screening plant

the TY reduction crusher by a bucket elevator, 50-ft. centers. Product of this crusher returns into the same screen.

Minus 2½-in. stone is carried over a 30-in. belt conveyor, 200-ft. centers, to the screening plant where it is passed successively over five Niagara mechanical vibrating screens. The first screen, in the top of the plant, a 4- x 6-ft. has 1¼-in. square openings on the top deck and ⅛-in. round perforated plate for the lower deck. The bulk of the dust (⅛-in. minus) is removed here and chuted to a bin, plus ⅛-in. material being passed by chute down to the next screen, a triple-deck 4- x 10-ft. screen.

On this screen the decks have 1-in., 9/16-in. and 7/32-in. sq. openings in order from top to bottom. The throughs (⅛- to 7/32-in. product) and stone retained on the bottom deck (7/32- to 9-16-in.) are finished products. Stone retained on both of the upper decks is chuted to another 4- x 10-ft. screen having ⅞-in. sq. openings on the top deck, 9/16-in. on the second deck, and the bottom deck is blanked. The ⅞- x 9/16-in. and minus 9/16-in. stone sizes are finished products, and plus ⅞-in. stone is split to two 3- x 6-ft. double-deck screens with 1¼-in. and ⅞-in. screen openings on top and bottom. Plus 1¼-in. stone is railroad ballast which is put in bins. Minus ⅞-in. stone is a finished product, and ⅞- to 1¼-in. stone is returned over an 18-in. belt conveyor, 110-ft. centers, to the crusher building. Here, it is put through the TZ crusher which is set to produce a ¾-in. product, and the discharge joins the throughs from the revolving scalping screen on the belt conveyor going to the screening plant.

Primary jaw crushers of all-welded construction through which mine run stone is first passed

Stone is not washed but the screens are equipped with the needed water pipe and sprays to begin washing later if there is need for it. Operations are at present balanced to produce a 100 percent marketable product without any sizes for which there is no sale. Capacity of the plant is normally 100 tons per hour fluctuating up to 125 tons per hour as the production of smaller sizes varies.

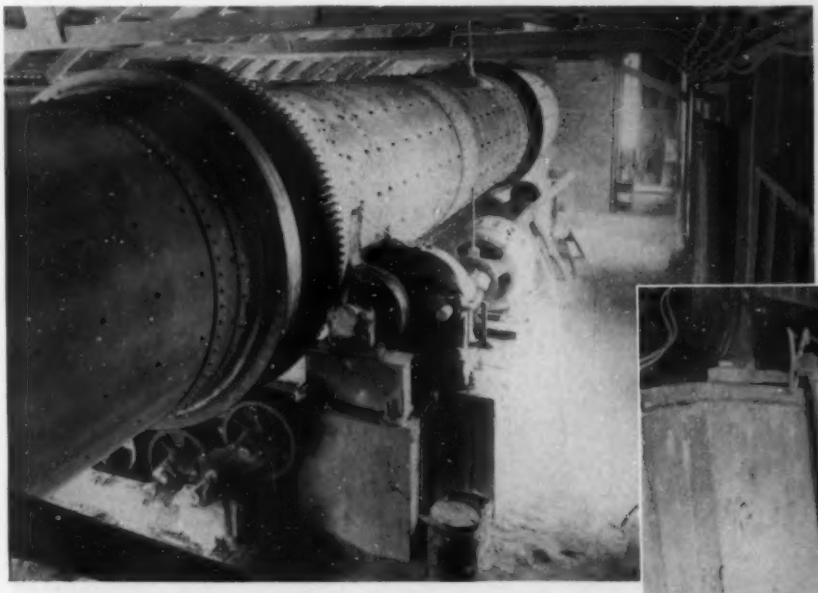
Storage capacity is 250 tons in four bins supplemented by stockpiling on the valley floor. The plant is on the Pennsylvania and Baltimore & Ohio railroads and ships by rail and truck.

Incidentally, to cut maintenance costs due to the highly abrasive nature of the stone, the plant has recently been equipped with a 300-amp. "Shield-Arc" Lincoln electric welder for building up dipper teeth, jaw plates, etc., with tungsten-carbon base metal. Albert Schreckenghost is superintendent.

New Agstone Plant

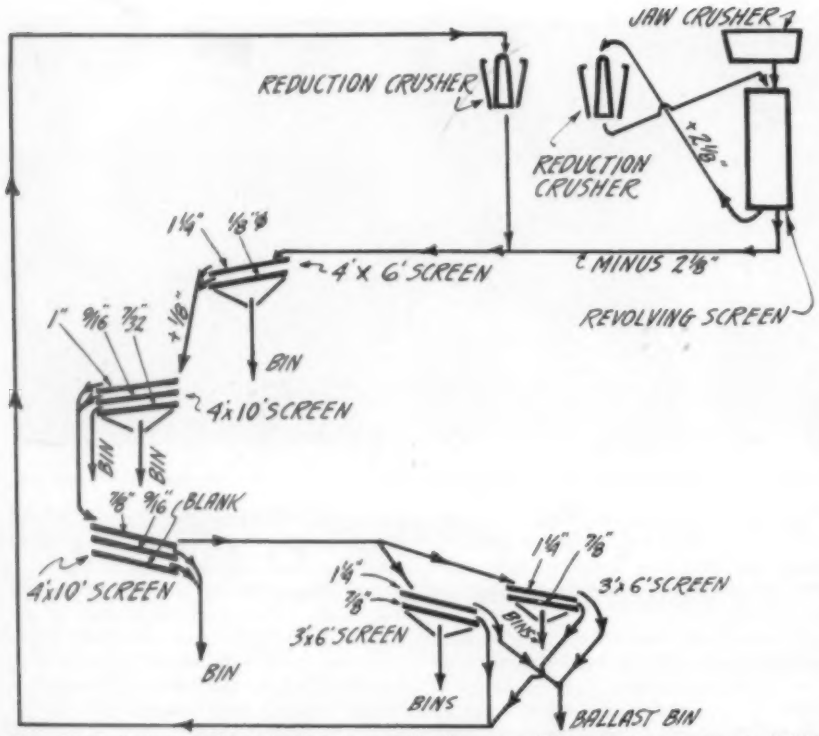
Located in the quarry of the Union Limestone Co. at Edenburg, Penn., is the company's new agricultural stone plant which is almost a duplicate of another operated on property adjoining the plant of the Lake Erie Limestone Co., Hillsville, Penn. At both plants, the raw material consists of stock-piled screenings for which the crushed stone operators have little market.

The plant consists mainly of a belt conveyor feeding into a revolving dryer, a scalping screen, two grinding mills, storage facilities and weigh batchers for truck loading. A 14-in. tunnel belt conveyer (Columbus) on 70-ft. centers fed



Above: Screenings are passed through a coal-fired rotary dryer before pulverization so that they will not blind the screens in the pulverizers

Right: One of the two 3-roll mills each of which produces about 15 tons of federal specification agstone per hr.



Flow sheet of rebuilt railroad ballast plant at Dunbar, Penn. The vibrating screens are fed in succession by gravity, without the use of elevators

by a reciprocating feeder delivers a continuous stream of screenings into a 70-in. by 45-ft. revolving dryer. The dryer, turning at 13 r.p.m., is driven by a 35-hp. motor through a Falk gear reducer, and is coal-fired by a Combustion Enginering Co. Skelley underfeed stoker.

Capacity of the dryer is about 45 tons of stone per hour which is greater than the average output of the two pulverizing mills following. Moisture contained in the stone must be reduced, usually to a fraction of 1 percent, to contribute to the efficiency of the pulverizing mills which have a discharge through internal cylindrical screens of comparatively small mesh. Surface moisture in the stockpiled stone averages 6 percent and sometimes is as high as 18 percent, which is compensated for by the feeder in the conveyor tunnel. The feeder is adjustable with a cut-off plate to regulate the volume of screenings carried.

At the feed end of the dryer is a 7- x 7-ft. bricked firebox. Stone is dried by induced heated air forced through the dryer in a counterflow direction. Coal consumption is 100 to 200 lb. per hour, dependent upon the moisture content.

Dried stone is elevated and put over a 3- x 6-ft. Niagara vibrating screen to scalp out the small contained percentage of plus 2-in. stone, which is wasted, and the screen throughs (2-in. down to dust) are stored in a 100 ton surge bin ahead of the grinding mills.

Pulverizing Methods and Equipment

Pulverizing is done in two Bradley, Jr. Hercules 3-roll mills which produce the finished product in one operation. From the overhead bin, the dried stone is released into a chute through rack and pinion gates and fed into each mill by revolving table feeders. The feeders are controlled automatically according to the amperage load carried by the mill motors.

All of the product is produced to meet soil conservation requirements, but other gradings may be easily made. Control of fineness and the gradation of product is exercised within the mill by changing the internal screen through which the fines discharge. To make the product mentioned, a 7-mesh wire cloth is being used, which is equivalent to a .095-in. opening. On similar equipment at the Hillsville plant other products such as asphalt fillers and rock dust for use in coal mines are produced to a fineness of 80 percent minus 200-mesh with a 32-mesh screen. This product and a No. 1 agstone (100 percent minus 20-mesh, 75 percent through the 60, and 65 percent minus 100) are packed in bags.

One of the mills in the new plant is driven by a 75-hp. squirrel-cage motor; the other by a 100-hp. G. E. synchronous motor, to correct the power factor. The mill discharges are elevated by a 60-ft. bucket elevator to a 265-ton ca-

(Continued on page 38)

Left: Scale at Edenburg plant for accurately weighing out agstone into trucks. Overhead bin is aerated through compressed air lines to facilitate flow into the batcher on left. Right: Two 3- x 6-ft. vibrating sizing screens to size intermediate stone at Dunbar plant

An Old Cement Plant Goes Modern

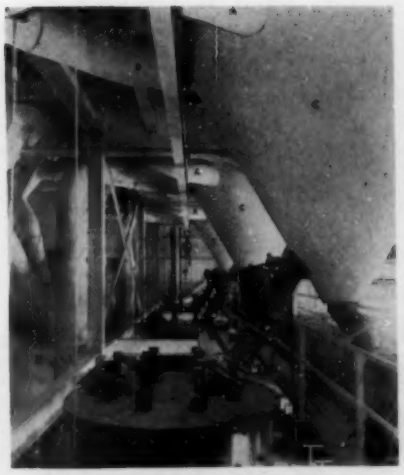
Hudson, N. Y. Unit of Universal Atlas Has Unusual Grinding Practices

By BROR NORDBERG

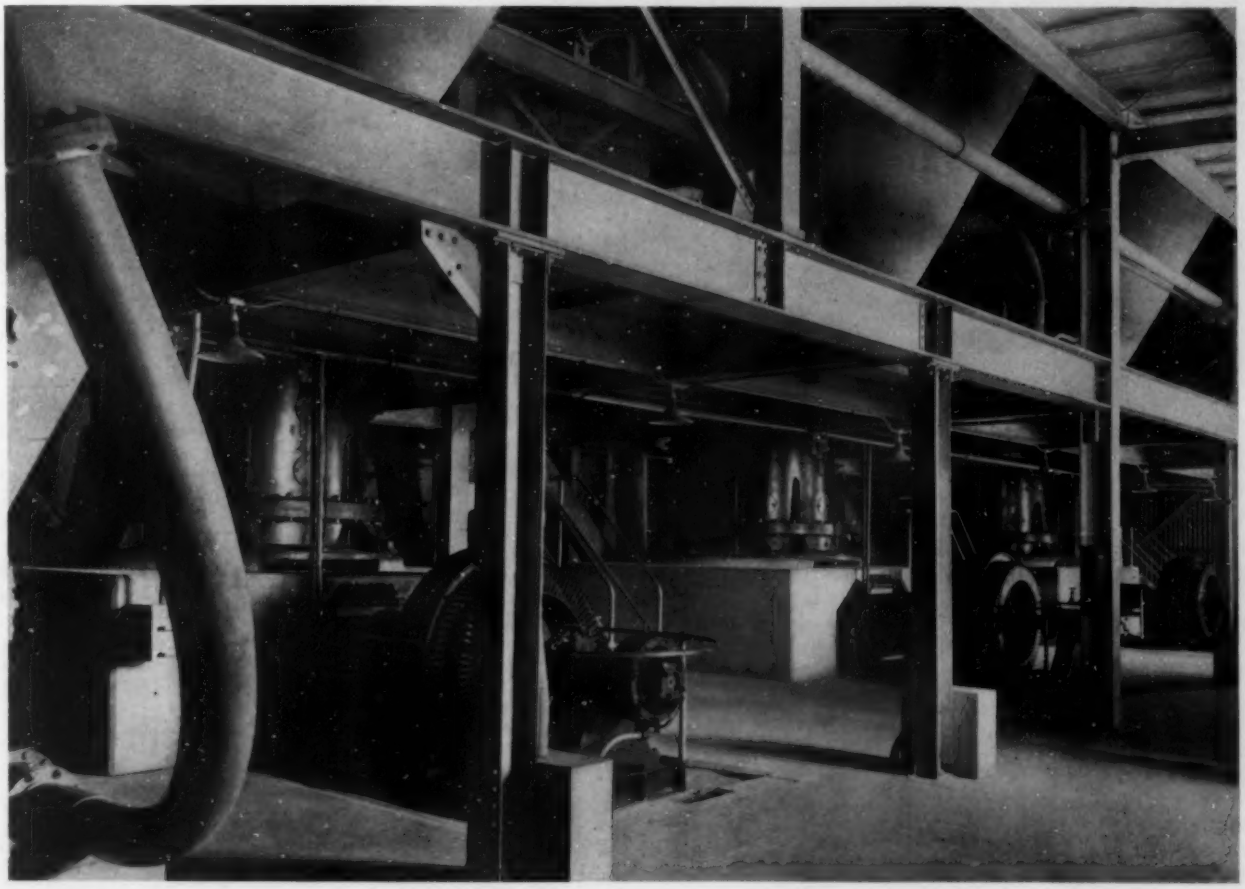
Operating features new to the portland cement industry have been incorporated in the rebuilt plant of the Universal Atlas Cement Co., at Hudson, N. Y. Its design includes the first raw mill grinding department where materials are dried simultaneously with mill operation, a flexible finish grinding department capable of a number of different grinding hookups, and automatic interlocking electrical control throughout.

Aside from the operating efficiency standpoint, a lot of attention has been paid to the confinement of dust and the development of dust control measures and to making the plant as neat and attractive as possible. Much of the old equipment and several mill buildings have yet to be dismantled before the entire property will assume its final appearance, but an extensive program of landscaping is already in effect to make the Hudson unit one of the finest in the country in appearance as well as efficiency.

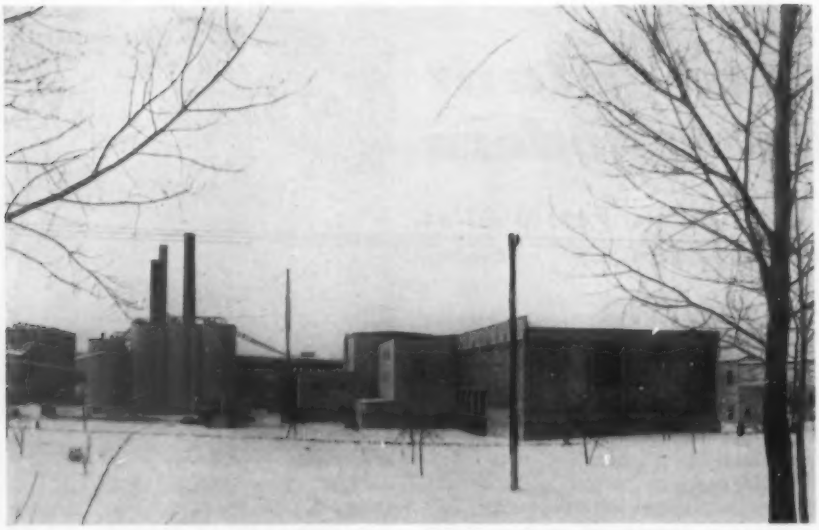
The raw grinding department is entirely new and is the first one in the United States where heat is applied simultaneously with the grinding, doing away with auxiliary drying equipment. The elimination of the conventional stone-drying department has made for a compact, efficient plant layout, comprising three units each consisting of



Hot air ducts, "A" conducting heated air from oil-fired furnaces into insulated air separators, "C"; moisture-laden air ducts, "B," from separators to dust collectors, "D"; automatic shut-off valves, "E," on reject spouts which feed the grinding mills

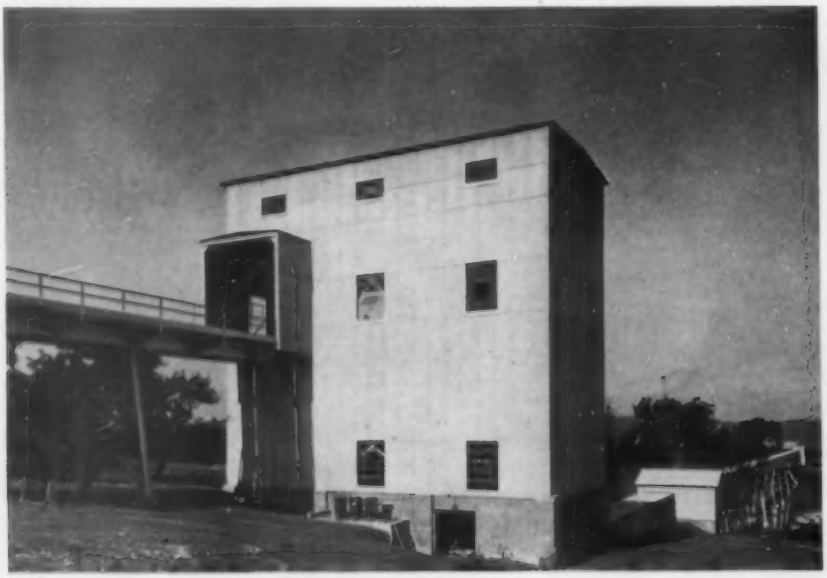


General arrangement of the raw material grinding department, with each of three mills operated in closed-circuit with a mechanical air separator. Rejects from the separators are the feed for the respective mills



General view of rebuilt plant. To the right is the stone storage building; center, raw and finish grinding departments; left, blending bins; extreme left, old mill buildings. The kilns may be seen between tanks and mill building

The limestone quarry, showing the electric shovels, and an electric well drill. Steam locomotives transport the stone, in 12-cu. yd. side-dump cars, to the crusher building



Crusher building, with trestle for incoming stone on the left; to the right is the belt conveyor structure which spans the federal highway into the stone storage bins at the mill

a type B, size 366 B & W mill closed-circuited with a 16-ft. mechanical air separator, heating and elevating equipment.

Considerable of the work of reducing kiln feed material to 200-mesh size is done by a large hammer mill secondary crusher which produces a high percentage of fines all of which is put through the air separator where heat is applied ahead of the grinding mills. This practice improves the efficiency of the latter machines and adds to their capacity.

Rock from the quarry is first reduced to 9 in. minus through a 42-in. primary gyratory crusher rated at 550 tons per hr. at this reduction, the crusher being driven through V-belt by a 300-hp. motor. Coming from the discharge opening of this crusher, a 60-in. apron-conveyor with manganese-steel flights puts the stone into the hammer mill. The hammer mill is driven by a reversible 700-hp. synchronous motor and has a capacity equal to the primary crusher.

Hammer Mill Product

At present operating schedules, the hammer mill is producing 2000 to 2500 tons of stone in 8 hr., 90 percent of which is minus 1-in. and contains considerable fines. Stone drops into the mill from about a 5-ft. elevation in order to have a proper amount of lap to enlarge the hammer effective areas for high speed operation. The direction of rotation of the hammers is changed by reversing the motors about every third day in order to give longer life to the mill hammers. Considerable study is under way at the mill to determine how to utilize the reversing property of the mill to greatest advantage in prolonging the life of hammers. About three pounds of manganese steel is being lost for each 1000 tons of stone.

The hammer mill product is carried by a series of three consecutive, totally enclosed 30-in. conveyor belts across U. S. highway 9E into the stone storage building next to the raw mill department. The conveyors, in order, operate on 1200, 100 and 315-ft. centers. The second conveyor is equipped with a continuous recording weight scale to record the production of the quarry, and the third conveyor operates in conjunction with a traveling tripper to place the stone into storage. Similarly, shale is handled through the same system and placed into storage, but the shale quarry is operated only one day each month which is all that is necessary to meet plant requirements.

Stone and shale are reclaimed by power crane into three pairs of 95 ton raw mill feed bins. Each grinding unit consists of the grinding mill, a 16-ft. mechanical air separator and auxiliary equipment including recording weight

scales to proportion the stone and shale from the 95-ton feed bin into a chain bucket elevator-conveyor rated at 880 tons per hr., a cloth dust arrestor, vent fan and oil-fired automatic furnace—all arranged as a unit for closed-circuit grinding.

The feed of raw material into the system is from the recording weight scales by belt conveyor into the boot of the continuous bucket elevator - conveyor and into the air separator rather than to the pulverizing mill first, which is the customary procedure. A sample of limestone taken from the delivery belt coming from the stone crushing plant will give some idea of the hammer mill performance as a preliminary crusher, the work left to be done by the mill to reduce the separator rejects to about 90 percent minus 200-mesh (kiln feed fineness) and is as follows:

Percent passing	Percent retained	Screen size
100.00	0.00	2 in.
99.33	0.67	1½ in.
97.58	2.42	1¼ in.
96.11	3.89	1 in.
93.30	6.70	¾ in.
87.00	13.00	½ in.
78.98	21.02	⅜ in.
64.48	35.52	¼ in.
34.98	65.02	10 mesh
23.86	76.14	20 mesh
19.34	80.66	30 mesh
12.91	87.09	50 mesh
8.81	91.19	100 mesh
5.87	94.13	200 mesh

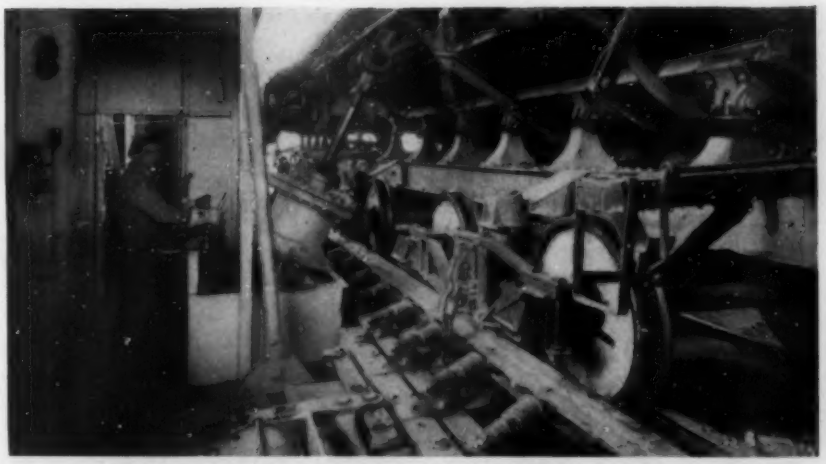
With the addition of shale and re-handling and inter-blending within the raw material storage building, typical samples taken on each of the three grinding mill units show the following:

	Separator feed (minus 200-mesh)
Mill No. 1.....	15.4 percent
Mill No. 2.....	17.3 percent
Mill No. 3.....	18.8 percent

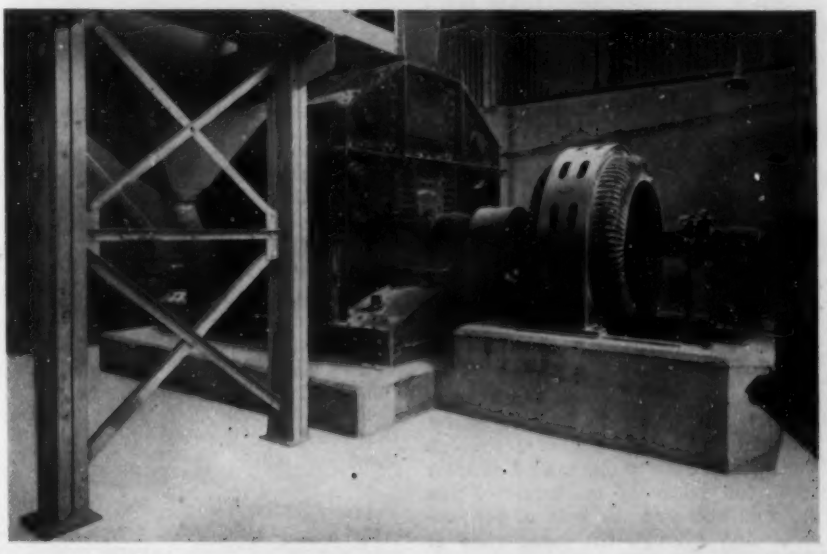
Mill	Separator rejects (minus 200-mesh)	B & W mill discharge (minus 200-mesh)
No. 1.....	11.4 percent	16.3 percent
No. 2.....	14.7 percent	17.9 percent
No. 3.....	12.7 percent	19.8 percent

Separator rejects, much of which are large particles, are the grinding mill feed, the mill discharging into the same elevator for re-passage through separator.

An interesting feature of the raw material grinding layout is that the auxiliary equipment is capable of handling sufficient material to allow the use of tremendous circulating loads, which are essential to get the maximum output of kiln feed material with minimum power. The average older cement plant is usually limited by the ability of existing conveying and elevating equipment to a circulating load of say, 300 or 400 percent, but at Hudson each mill is producing an average of 40 tons of material (about 90 percent minus 200-mesh), with circulating loads averaging about 1200 percent. Circulating loads up to the full capacity of the elevator (about 2000 percent) have been tried but did not give as economical production as

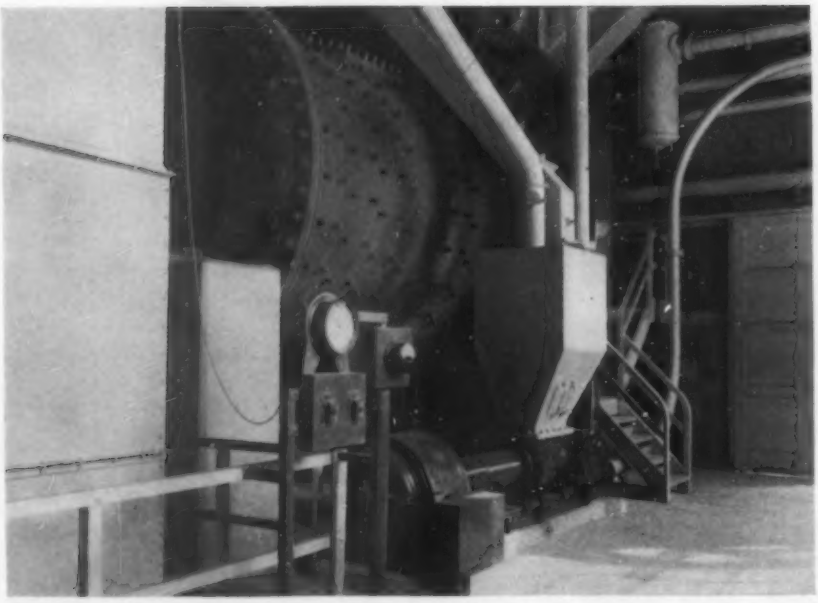


Showing how quarry cars are tilted by pneumatic hoist at the primary crusher and how the operator spots the cars with a pneumatic car retarder



Large reversible hammer mill which is fed 9-in. stone over a 60-in. apron-conveyor. The direction of rotation of the hammers is changed every third day by reversing the motor

Recording weight feeding scales to regulate flow of stone into the raw mill—air separator circuit. They are interlocked mechanically in pairs, for shale and limestone, to automatically control proportioning of limestone and shale and rate of feed for maximum output of mill



Preliminary ball mill which grinds clinker to 20-mesh. Also shown is one of the cement pumps

the lower figure. Needless to say circulating loads as high as this are an asset to close blending and one of the reasons why this plant can hold its blending to 0.5 percent of a constant requirement.

Fines from the air separator are finished raw material, which is handled by screw conveyor and pumped into blending bins by a 10-in. cement pump.

A negative pressure is maintained through each system by a dust collector vent fan which draws heated air through the entire length of the bucket elevator from the point of discharge of the grinding mill into the boot of the elevator and through the inner cone of the air separator. Heated air enters the air separator at the bottom of the distribution plate within the inner cone and flows between the two cones and into a duct to the dust collector. With circulating loads of 1200 percent, incoming fresh feed variations in moisture are highly diluted with heated material so that slugs of wet material do not enter the grinding mills. This is a necessary contributing feature to mill efficiency. Dust precipitated from the automatic cloth-bag dust arrestor is put back into the boot of the elevator.

Heat for drying the raw material is developed by oil-burning thermostatically-controlled furnaces, which consume about 9 gal. of fuel oil per mill hr. Air temperatures in the duct coming from the furnace are 700 to 725 deg. F., and exhaust temperatures after passing through the dust arrestor are 150 to 175 deg. F. Moisture content of the limestone is 1-1½ percent, the shale averages 3 percent moisture, and the moisture content of the finished raw material is reduced to 0.1 to 0.2 percent. The air separator and all piping through which heated air is passed is covered with a 3-in. thickness of insulation.

Heating capacity of the system is sufficient to dry the raw material to the desired percentage of moisture for all quarry conditions—the limiting condition of the overall grinding system being that exhaust temperatures through the bag collector cloth are below the dew point, and the capacity of the elevator and mill.

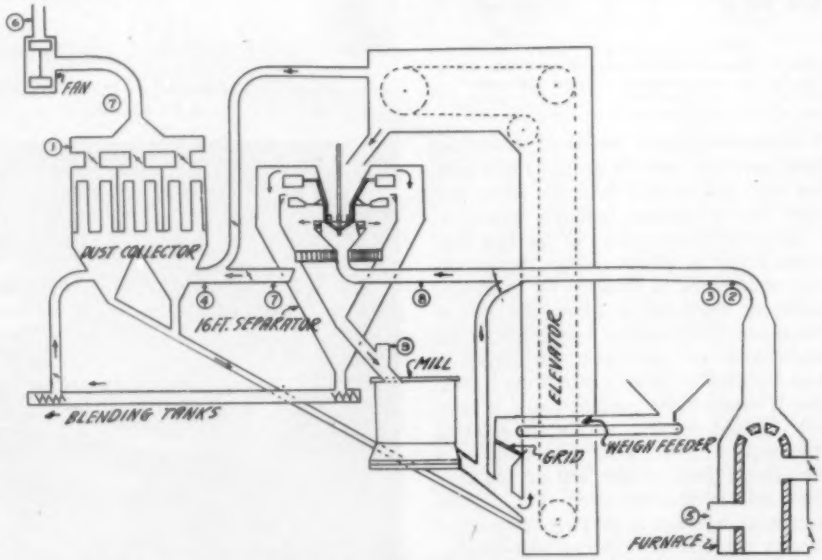
Should the pulverizing mill become overloaded, the rate of feed into it is automatically reduced to one-half by a system of relays when the elevator amperage indicates an overload, the recording weight feeders being interlocked mechanically in pairs with each pair driven by a 10-hp. 1200—600 r.p.m. motor. The extent of the circulating load is measured by the elevator motor amperage. The raw mill department, as well as the entire plant has all machinery units interlocked electrically, so that no machine can be started until those ahead of it are operating satisfactorily. Another automatic device that is a safety precaution in event the grinding mill be shut down for any reason is an automatic valve that will stop the feed into the mill and temporarily convert the air separator into a storage bin.

The entire department is compact and occupies comparatively little plant floor space, doing away with a number of miscellaneous mills and other equipment. The various connected electrical power units for each of the three grinding systems are:

Pulverizer	600	hp.
Weigh feeders (two)	10	hp.
Elevator	60	hp.
Air separator	100	hp.
Furnace oil pump	½	hp.
Vent fan	10	hp.
Total	780½	hp.

Finish Grinding

The clinker grinding mill, also entirely new, likewise represents advanced practice and utilizes closed-circuit grinding to the fullest. This department, however, is still the subject of much



Raw mill circuit, illustrating how the heated air from the furnace is introduced into the air separator and elevator. Control devices are: (1) fan failure safety switch; (2) indicating and control thermostat—maximum temperature, 700 deg. F.; (3) high temperature safety thermostat —maximum temperature, 725 deg. F.; (4) high-low fire control thermostat—setting range, 150-175 deg. F.; (5) automatic oil shut-off valve; (6) recording thermometer bulb; (7) differential manometer connection; (8) inclined tube gauge connection; and (9) automatic tailings valve

study as to methods of closed-circuiting to get highest efficiency and will likely see some re-arrangements when the plant re-opens in the Spring.

For the purpose of discussion here, we will first describe how the mill was operated in 1938 and mention some alternatives tried and under consideration.

Clinker (hard burned at 2600—2700 deg. F.) is first reduced by a roll crusher to ¾ in. minus, placed under covered storage and reclaimed in the same way that stone is handled.

Gypsum and clinker are placed by an overhead crane into two separate compartments of a bin in the finish grinding department and are proportioned by a pair of weighing feeders to a bucket elevator feeding a 4- x 10-ft. double-deck vibrating screen. The top deck takes some of the wear off the lower deck and a split is made on ⅜ in. Plus ⅜-in. clinker is put through a 10-in. suspended gyratory crusher which discharges into the original bucket elevator for recirculation over the screen, forming the first of four closed-circuits operated in clinker grinding for the better part of 1938.

The screen throughs are the feed for a 10½- x 12-ft. preliminary ball mill and are delivered to it by a drag conveyor and screw conveyors. Purpose of this mill is to produce a 20-mesh product for feed to the finish mills. Until recently the preliminary ball mill throughs were elevated and split over four 4- x 10-ft. single-deck vibrating screens where a separation was made at 20-mesh. Tailings then returned into the mill and minus 20-mesh material was conveyed by screw conveyors to the finish mill feed bins.

With a ball loading of 117,500 lb. of 3-, 2½-, and 2-in. diameter hardened steel balls, there was no circulating load in evidence over the screens because the grinding capacity at the mill was sufficient to reduce all material to minus 20 mesh. Accordingly, the screens were taken out, but one likely will remain as a safety factor in the event the mill should at some time discharge a little plus 20-mesh material because of variations in the clinker.

Final grinding is done through three finishing units, each consisting of an 8- x 30-ft. compartment mill and two 16-ft. mechanical air separators. The mills are two compartment machines and receive their feed from each end with peripheral discharge at the center. The first compartment receives its feed of 20-mesh minus material from the mill feed bins through rotary feeders driven by variable-speed reducers.

One of the air separators receives the product of the first compartment over a bucket elevator and the rejects are returned into the same compartment. They are returned by gravity into the screw conveyor feeding fresh material into the mill. Fines from this separator are the feed for the second compartment and are introduced by screw conveyor into the far end of the mill. Similarly, the product of the second compartment is closed-circuited with the second air separator, the rejects are returned and the fines (finished product) are pumped by an 8-in. cement pump into storage silos. The mills are air-swept, and a bag-type dust collector for each finishing unit gathers dust and places it into a finished cement screw conveyor.

At right is thermostatically-controlled, oil-burning furnace which develops the heat needed to dry the raw material while in the grinding circuit. Concrete-housed circulating load elevator is on left center

Standard portland cement is the only product manufactured at Hudson and it is ground to a surface area of 1800 cm² per gram at the rate of 375 bbl. per hr. The average clinker temperature coming from storage is slightly more than 100 deg. F. and the final product is kept down to about 200 deg. F. because of the large radiating surface in the system.

The hookup just described is that used throughout 1938, but the arrangement of equipment affords a number of possibilities, some of which have yet to be tried—among them being an increase in mill speeds and a rerouting of material through the air separator-mill circuit.

To start out the 1939 operating season, one grinding unit will be operated the same as in 1938, a second will be similarly arranged but with the ball mill speed increased to about 72 percent of critical speed and the third will have the fines from the first separator going into the second separator, with the rejects only being fed into the mill. This arrangement will require grinding only the larger particles in this compartment.

Present ball charges have already been increased from about 52,500 to 81,000 lb., of 1- x 1¼-in. steel balls in the preliminary compartment and from 52,500 to 81,000 lb. of ⅜- x ⅞-in. balls in the finish end of the mill, with a rotating speed of 18.6 r.p.m. Each mill is driven by a 700-hp. synchronous motor.

Kilns and Clinker Treatment

Peak kiln capacity of the plant is more than 7500 bbl. of clinker daily with the three original 12- x 233-ft. kilns in operation, but the kiln department has been modernized and the kiln speed has been synchronized with the feed by the installation of new speed reducer drives. Three direct-firing unit coal mills have displaced a complicated coal department. The installation is typical of others in the portland cement industry, with heated air being taken from the primary rotary clinker coolers to dry the coal, the coal and primary air mix being lifted about 50 ft. vertically to the kiln hoods. The coal feed is held constant, the only variable in operation being the rate of rotation of the kiln. Each kiln produces an average of 110 bbl. of clinker per hr. Kiln control equipment, such as automatic draft controls, recording radiation pyrometers, gas analyzers and the like which have been instrumental in the maintenance of very favorable fuel ratios in the past are retained.

Clinker is cooled through two-stages, first through 10- x 77-ft. 8-in. rotary coolers, which discharge at 1200 deg. F., followed by 12- x 36-in. rolls and then

Typical of the modern equipment is the air compressor installation in the main power house

6½- x 78-ft. coolers, which reduce temperatures to slightly over 100 deg. F., after which it is placed in storage.

The Quarry

One of the first steps in rebuilding the plant was the electrification of the quarry in 1936, where two electric shovels with 2½-cu. yd. buckets and Ward-Leonard controls displaced steam shovels, and electric well drills and wagon drills were introduced. The quarry is across the main highway about ½ mile east of the cement mill. Three distinct formations of limestone, varying from 60 percent to 95 percent $CaCO_3$ are being worked, with about a 90-ft. face. The quarried products are inter-blended in the stone storage building. The upper 18-ft. of the ledge is hard cap rock which requires some special treatment in blasting and closer spacing of drill holes by the wagon drill to reduce secondary blasting. Other blast holes are 9-in., put down by a crawler-mounted well drill.

Haulage is done by two steam locomotives each of which pushes a train of five 12-cu. yd. side-dump cars to the crusher building.

At the crusher building provision is made for handling and spotting cars by gravity without the use of the locomotives. Car rails are extended beyond the crusher building on a trestle inclined slightly back toward the quarry. Operating on a loop system, the locomotive spots the first car at the primary crusher and returns to the quarry with a train of empties. Cars are then spotted by a pneumatically-operated car retarder and tilted by a pneumatic hoist, designed by company engineers, into the primary crusher. After emptying all cars, the train is released and returns by gravity to the side track where it is picked up by the locomotive.

Blending of raw materials is developed to a degree where it approximates the blending uniformity attainable in wet process plants. Blending is accomplished first in the method of placing in and reclaiming material from storage, secondly in the raw grinding department where extraordinarily high circulating loads intermix the material, and finally in drawing off from blending bins for handling to the kiln feed bins. In the rock storage building, which is 560 ft. long and 100 ft. wide, stone is placed by the traveling tripper and spread out in parallel rows by an overhead crane. Reclaiming is done by picking up the stone by crane in parallel rows at right angles to the rows of material as an aid to blending.

After further blending during the process of grinding, the kiln feed product is pumped into six 30- x 80-ft. concrete silos which have steel hopper bottoms. While one silo is being filled, material is drawn from the other five and blended, the control being exercised by rotary feeders driven through variable speed-reducers. Material is drawn from each silo through a single opening below and the flow goes crosswise to the material in the bins, resulting in further blending. Ultimate blending is held to within 0.5 percent of the desired holding point. Handling from the blending silos is by screw conveyors to a 10-in. materials pump which places the material into two storage bins, from which it is reclaimed by screw conveyors and elevators into kiln feed bins. Additional facilities are provided for the blending of small batches of special mix material in bins where compressed air is boiled up through floor to agitate material.

The storage building for raw materials is of reinforced concrete construction with a lightweight barrel-type roof of European design and is divided into three sections. Capacity is provided for 33,000 tons of limestone, 4800 tons of shale (about 6 percent of the mix), 170,000 bbl. of clinker and 2200 tons of gypsum.

Finished cement is pumped by an 8-in. cement pump into two groups of concrete silos, each comprising 12 silos and 6 interstice bins, and with a combined capacity of 312,000 bbl. Additional storage of 208,000 bbl. is provided on the bank of the Hudson river about 1½ miles from the plant proper for use in bag packing and bulk loading into barges for river shipment.

Cement is delivered into these silos by a combination of railroad cars and pneumatic pump transportation. Cars of 300-bbl. capacity are loaded at the main plant and hauled by a 600-hp. Diesel-electric locomotive to a transfer station where they discharge into a screw conveyor and the cement is elevated into a 300-bbl. bin. Vibrators hung against the sides of the cars facilitate discharge into the conveyor.

A 6-in. pump reclaims cement from this bin and transfers it into the wharf stockhouse through a 1120-ft. line. Its discharge is into the stockhouse or directly into a screw conveyor ordinarily used to transfer cement from storage into the packhouse. A traveling crane from which two bucket elevators are suspended is used in reclaiming cement to this screw conveyor. Cement is sacked by 4-spout Bates packers and loaded over a steel mesh conveyor, designed for cleaner packaging, into barges.

Electrical Power

The entire mill is electrified with individual motor drives for all equipment. Electric power is purchased from the local power company and is brought in at 66,000 volts with reduction to 2300 volts, 440 volts and 110 volts for various sized motors and plant lighting.

The plant is exceptionally free from dust. With new-type tight equipment very little dust has the opportunity to escape and dust arrestors are used throughout to handle any that does. The various mill circuits are operated under negative pressures and unit pressure suppressors are used at the ends of transport points, etc.

The entire modernization program was planned so that plant operations were carried on without interruption during the period of construction. Work started in 1936 with the electrification of the quarry and continued until March 15, 1938, when the entire plant was rebuilt and put in operation. The engineering department of the company headed by Paul C. Van Zandt, vice president, and S. J. Robison, chief engineer, designed the mill and its construction was supervised by R. A. Dittmer, general superintendent of the plant. The design is such that the capacity of any or all departments can easily be doubled at some future date.

Alabama's New Sand Plant Uses Rail Haulage

By BROR NORDBERG

At Tuskegee, Ala., about 40 miles east of Montgomery, the Tuskegee Sand and Gravel Co., started production early last year in a new plant located on the Tuskegee Railroad. The plant location is on land containing a very high grade of angular sand, and gravel, much of which is exposed in the bends of a meandering stream.

The bulk of the material excavated is taken from the pit by a 1¼-cu. yd. Bucyrus-Erie, full Diesel dragline and delivery to the plant is over a 36-in. gauge industrial railway track. Operating on the level of the road bed, the dragline digs downward into the deposit, filling 5-cu. yd. cars which are hauled to the screening plant, about one-quarter mile haul, in two trains of five cars each by a 20-ton Vulcan steam locomotive. A 12-ton Plymouth locomotive is used as a switch engine on the sand bar.

Along the stream running through the property is a large bed of practically 100 percent sand and gravel unmixed with impurities, which also is under excavation. This material extends several feet above the water level, has no overburden, and continues up the river bed to a depth of several feet. Total capacity of the plant is 125 tons per hour.

Cars are of the side dump type, discharging into a 30-cu. yd. hopper, where the sand and gravel are fed by a Telsmith reciprocating feeder to an 18-in. Robins belt conveyor, 192-ft. centers, for delivery to the screening plant.

Generate Electric Power

Power is generated at the plant, all equipment being operated electrically with individual motors. Total connected power is 95 hp., a requirement easily met in the new power unit which is a Fairbanks-Morse model 36 E 12 120-hp. 2 cyl. Diesel engine direct-connected to a Fairbanks-Morse 96 kva. alternator driven at 360 r.p.m. Electricity is developed at 240 volts. Excitation is by means of a 5 kw. direct-current generator driven through a Dodge V-belt. The Diesel engine is started with compressed air at 120 to 175 p.s.i developed by a Fairbanks-Morse 3- x 3½-in. Eclipse compressor driven at 600 r.p.m. by a 2-hp. gas engine.

Screening and Washing

Designed primarily for rail shipments, the plant is of timber and frame construction. The belt conveyor discharge is to a 4- x 12-ft., 4-deck Telsmith Pulsator vibrating screen, which is driven through a Dayton drive by a 10-hp. motor. All material is washed over the screen under pressure. Wash water (900 g.p.m.) is delivered to the screen by a 5-in. Fairbanks-Morse pump driven by a 25-hp. motor.

Three sizes of aggregate are produced over the screen; the oversize goes to a bin, and the throughs from the sand deck are flumed to a Telsmith No. 8 automatic discharge sand tank. By interchanging screen cloths on the lower deck, either concrete sand or mortar sand can be recovered in the sand tank,

Left: Surge bin feeding a reduction crusher. Note portable conveyor in background for direct loading of crushed gravel

Right: Automatic continuous-discharge, sand settling tank for making concrete sand and mortar sand

Screening plant of the Tuskegee Sand & Gravel Co., Tuskegee, Ala. To the rear is an asphalt plant which uses a considerable portion of the output

with the overflow laundered to waste.

Adjacent to the plant has been built a Warren asphalt plant which will take a good percentage of the sand output. This plant is so located that all, or part, of the sand that is produced can be by-passed the settling tank and flumed directly to the stockpiles of the asphalt plant, which is known as the Tuskegee Asphalt Co.

Oversize Material Is Crushed

Total bin capacity of the plant is 400 tons, in five bins. Oversize gravel from one of the bins can be drawn through a slide gate and put through a Telsmith size 32B reduction crusher which operates under choke feed. The crusher is driven by a 40-hp. motor through V-belt with a V-shieve on the motor drive and V-grooves in a flat pulley on the crusher side. Probably 10 percent of the gravel production is crushed, and then taken directly over a 16-in. portable belt conveyor loader into railroad cars.

W. M. Blount is president and general manager of the Tuskegee Sand and Gravel Co., and Wilson Runnette is vice-president.

Non-Durable Chert

MANY RIVER GRAVELS in the South and Southwest contain chert, some good and some bad to use as aggregates. A writer in the January, 1939 issue of the *Journal of the American Concrete Institute* gives a method of telling one kind from the other, at least as regards the variety found in northeast Missouri. He writes: "The durability of white chalky and vitreous types of chert found in this locality has been found to depend on the absorption and specific gravity, which are closely related for this material, for as the absorption increases the specific gravity decreases.

"By running extensive tests on the specific gravity versus durability in freezing and thawing of the material confined in concrete specimens, it was determined that a chert with specific gravity lower than approximately 2.35 was definitely non-durable.

"In order to acquaint inspectors with types of durable and non-durable chert, a solution of potassium iodide in mercuric iodide (Thoulet solution) was diluted to a specific gravity of 2.35 and the light chert floated off. After becoming acquainted with the visual characteristics of the non-durable chert, inspection and acceptance of individual shipments was accomplished by 'picking' and weighing of this material."

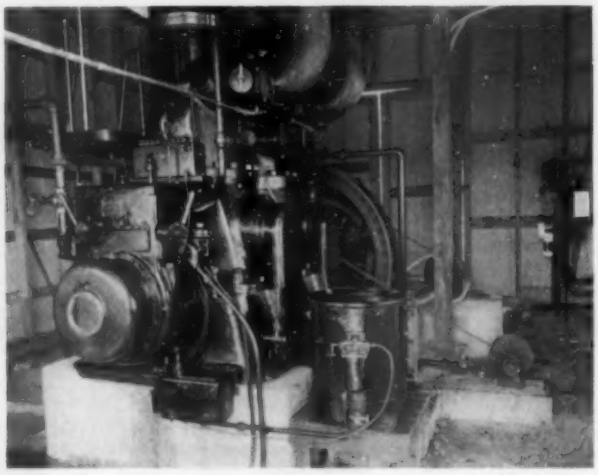
Double Agstone Capacity

(Continued from page 30)

pacity steel bin. From storage, the finished product is released through a Heltzel diaphragm-type valve (a design used for handling cement and other fine material) into a 5-ton Heltzel "Agrabatcher." Weighing is done by a Kron scale. Bins, elevators and other steel work were also furnished by Heltzel Steel Form and Iron Co.

Compressed air at 90 p.s.i. is introduced into the bin just above the discharge valve and through a flexible hose into the weigh batcher to aerate the material and facilitate its flow. Trucks with high stake bodies are loaded from a second batcher on the side of the main bin. Lester Miller is superintendent of the plant.

In merchandising agricultural limestone, effective use is made of direct mailing pieces printed in color which are mailed to customers and prospective customers of the dealer organization. Typical of this advertising literature is a "highway reference map" showing principal highways and towns, as a guide in directing customers to both agricultural limestone plants. Similar maps and other information is contained in small pocket note-books which are distributed at county fairs.



Left: Vibrating sizing screen with belt conveyor discharge overhead. Right: Power for all operations is developed by a 120-hp. Diesel engine, direct-connected to a generator

Magnetic Separation For Industrial Minerals

By RAYMOND B. LADOO*

The Ball-Norton type of separator is a variation of the magnetic pulley principle. This is described by Taggart[4] as follows:

"This machine consists of a closed drum of non-magnetic material, such as brass or bronze, revolving around a segment of a stationary electromagnet which covers between ½ and 2/3 of the face of the drum. These magnets are wound so that adjacent poles are of opposite polarity. Electrical connection is made through a hollow shaft. When ore, properly crushed to free the magnetic material, is fed onto the upper part of the drum, in the direction of rotation, the non-magnetic portion rebounds or slides off while the magnetic material is drawn down to the face of the drum by the magnetic force. As any given magnetic particle is carried forward, however, from the field of one magnet into the field of the next, then, because of the fact that the change in position of the particle is more rapid than the change in polarity of the induced magnetism, the particle turns end for end in order to present the proper pole to the succeeding magnet. In so doing it leaves the surface of the drum and thereby frees any non-magnetic that may have been mechanically held by it in position on the drum. This winnowing effect is repeated from pole to pole until, by the time the bottom of the drum is reached, most of the non-magnetic and weakly-magnetic particles have been shaken out. This agitation of material by means of magnetic circuits of alternating polarity is one of the outstanding advances that has been made in the art of magnetic separation. At the point on the periphery where the segmental battery of magnets terminates the magnetic particles leave the drum by centrifugal force and gravity and fall into the concentrate hopper."

The drum separator, illustrated in principle in Fig. 3, is lower in cost and more compact than a magnetic pulley but it has the disadvantage that the drum wears out, due to abrasion, faster than a rubber belt passing over a pulley.

In this drum separator, magnetic force still has to hold grains against gravity and centrifugal force, and it is not efficient for the removal of feebly magnetic minerals.

The modern, high intensity separator deflects magnetic grains from a falling stream, not by pulling or holding them against gravity.

Ramsey and Brier[5] have well described the fundamentals of an efficient high intensity separator, from which description the following is abstracted:

In the sketch, Fig. 4. the ore, crushed finely enough to free the magnetic impurities, is fed down onto the top surface of a horizontal rotor which slowly revolves (100 to 200 r.p.m.) between the pole pieces of a powerful magnet. Non-magnetic particles are freely discharged in an arc as shown at B, while magnetic particles, clinging to the rotor a little longer, drop nearly vertical or are pulled back from the vertical, as at A. The magnetics, which are separated from the "non-magnetics" by an adjustable vertical knife edge divider, are removed from the machine through a chute. The "non-magnetics" drop to a second rotor vertically below the top rotor, where a stronger magnetic field is used and more feebly magnetic particles are removed. Again the "non-magnetics" drop to a third rotor in a little more strongly energized field, where any feebly magnetic particles are caught which escape the second rotor. Additional rotors may be and sometimes are used where a complicated separation of a number of products is to effected.

This article on high intensity magnetic separation completes the series, the first of which appeared in ROCK PRODUCTS for January, pp. 64 and 65. In the first article, the principles of this interesting method of separation of industrial minerals were explained and two types of equipment were described. The second part, appearing in this issue, describes more complicated equipment and the advantages of sizing by magnetic means.

Fig. 3: Drum type separator comprises a closed drum of non-magnetic material, revolving around a segment of a stationary electromagnet

These are the bare essentials of this type of separator, but in the different makes of separators these principles are worked out in varying structural and mechanical detail. In high intensity magnetic separators important factors are the design and construction of the rotors, the quality of the magnetic iron used, the method and quality of the coil windings, the position and control of the knife dividers, variable speed control of the rotors, type of feeder and material from which it is made. The shape and position of the pole pieces is a very important factor.

Power requirements vary with different sizes, types, and makes of machines, but in all cases are surprisingly low. For example one make of separator uses only 300 to 500 watts for energizing the magnet coil of a double 3-roll machine with 30-in. rotors, and a 2 to 3 hp. motor on the rotors.

Capacities vary even more widely, depending not only on the sizes, types and makes of machines, but also upon the ease of separation, fineness of ore feed, purity of finished product required, etc. All other things being equal, the greater the content of fine dust (say minus 200 mesh) the slower must be the feed rate. But, on the same feed, comparable sized separators of different makes show varying capacities and recoveries for the same finished product specification. The range of capacities for 3-roll 30-in. rotor machines, under average conditions may be from ½ ton to 2 tons or more (head feed) per hour. Recoveries may range from as low as 60 to 65 percent to as high as 90 percent or more of the head feed.

Varying results obtained with different makes of separators may be attributed to several different factors, among which are the physical properties and condition of the feed, structural differences in separators, and varying skill of the operators. One make of machine may do better on one ore and another make may give better results on another ore.

Size and Condition of Feed

In very general terms it may be said that the ore to be treated should be crushed to somewhere between 8-mesh and 200-mesh, but this is much too general for any specific problem. To get the most efficient results the question

* Consulting Engineer in Non-Metallic Minerals, 42 Hunting Road, Newton, Mass.

of proper sizing requires a great deal of careful study.

An erroneous idea, held in some quarters, is that there is a critical size for the proper separation of some minerals. In other words, it is believed that there are some minerals which, no matter where they come from or what their inherent physical characteristics, must always be crushed to a certain specific size range. Patents for processing specific minerals have even been granted on this incorrect assumption.

As a matter of fact, the old, well known, basic principles of ore milling apply with full force. These are:

(1) The ore must be crushed or ground finely enough to liberate the minerals to be separated, with a minimum of attached and included particles.

(2) For the sake of economy (and for additional reasons in the case of magnetic separation), the crushing or grinding should be stopped when the ore is fine enough for successful treatment. Extreme fines are nearly always hard to separate, wet or dry, in most ore concentration processes. In wet jigging or tabling, for example, the ore is crushed to liberate the various minerals and no finer,—the making of "slimes" (fines) is avoided.

In high intensity magnetic separation, there is the further general requirement that the grains be at least as fine as 8-mesh to handle properly through the machines.

A feldspar from one deposit may be successfully separated by crushing to 16-mesh. Another feldspar may contain impurities which are not released until crushing proceeds to 30-mesh. Still another feldspar may have to be ground to at least 100-mesh to free the majority of magnetic particles.

These principles apply with full force to all minerals, ores, chemicals or other materials which are to be magnetically separated. They were clearly stated by Gunther[1] in 1909 and are as true today as they were then.

The object is to get a clean, dust-free uniform mixture of grains of pure mineral of value and equally clean pure grains of magnetic impurities. This ideal, of course, is never completely achieved in practice. No matter how fine we crush we usually still have a few grains of pure mineral to which are attached or in which are wholly included small particles of magnetic impurities. These are called attached or included middlings.

The point at which crushing should be stopped depends in part on the nature of the ore, in part on the efficiency of the separator, and in part on economic considerations. While the finer the grain size the more complete is the unlocking process, yet the finer the grind the greater the percentage of impalpable dust. As the percentage of dust increases, the capacity of the separator decreases, tailings losses increase, and

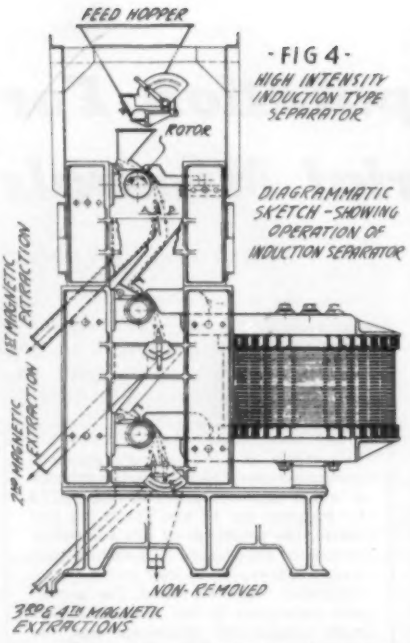


FIG 4
HIGH INTENSITY INDUCTION TYPE SEPARATOR

DIAGRAMMATIC SKETCH - SHOWING OPERATION OF INDUCTION SEPARATOR

Fig. 4: High intensity induction type separator in which the material is fed through a series of rotors which slowly revolve between pole pieces of powerful magnets

grade of finished product becomes poorer. On the other hand, if too little crushing is done too many included middlings are made, which, unless retreated, increase the tailings loss. But if crude ore costs were low enough and separator capacity could be greatly increased by coarser crushing at the expense of high tailings loss, the gain from increased capacity might more than offset the cost of tailings loss. Relatively coarse crushing may also be profitable economically if middlings are retreated. This possibility will be considered later. It is evident then that in crushing any ore for magnetic separation there is a point of maximum mechanical efficiency and of greatest economic efficiency. These points can only be determined by experimentation. It should be emphasized again that the best conditions must be worked out for each ore individually and only by coincidence will the best conditions for a mineral from one deposit be the best or even controlling conditions for the same mineral from another deposit.

Two other questions on crushing and sizing arise. (1) Should the crushed ore be screened into two or more size fractions, say minus 20 plus 50 mesh and minus 50 mesh fractions, and each fraction treated separately? (2) Should fine dust be removed before separation? The answers to these questions depend upon both mechanical and economic considerations.

Beyond a certain percentage, determinable only for each ore individually, the presence of fine dust decreases separator efficiency. Up to that point the presence of dust seems to make little difference if its content is fairly uniform. The allowable percentage of fine dust varies both with the ore and with the separator—some separators seem to be able to handle more dust than others. "How fine is 'fine dust'?" has often been asked. That, again, depends on conditions. It is largely a question of flowability, which is a function of moisture content, grain shape, specific gravity and inherent "stickiness."

Some materials screened all through 200-mesh and all on 325-mesh, if dry, will flow freely and separate perfectly. In general, though, material finer than 200-mesh will not separate well. It will not flow freely and the particles are so light that air currents around the separator will interfere with the normal interplay between magnetic force, gravity and centrifugal force. Static electrical charges on the particles also make fine particles stick to coarser ones, carrying iron into the pure product or pure mineral particles into the tailings. Some fine dusts also cling to the rotor and tend to build up on it.

If there is a ready market for high iron fines at a good price they should be removed. If they must be thrown away or sold at less than cost, crushing and grinding methods should be used which will keep the percentage of fines down to a point where they can be handled by a good separator.

Theoretically and usually practically there is an advantage in splitting separator feed into two or more size fractions and treating each separately. This is particularly true if there is a large percentage of included middlings, and of not so much importance in clean mechanical mixtures (such as a mixture of pure silica sand and pure magnetite grains).

Advantages of Sizing

The advantages of sizing are two-fold. First, greater separator capacity and efficiency usually result, because best feed rates, rotor speeds and positions of knife-edge dividers vary for each size, due to differential interplay of magnetic force, gravity, and centrifugal force. With an unsized feed these variables have to be set for an average grain size, not the best for either finer or coarser grains. Second, if a sized feed is used, the retreatment of middlings is simpler and more feasible. In a 3-roll separator the top rotor has a relatively low magnetic pull and it removes only the clean, most highly magnetic impurities. The percentage removed here is usually low and the product high in iron, so that it can usually be discarded as true waste. The second and third rotors operate in a much stronger magnetic field and remove both included and attached mid-

dlings and the most feebly magnetic minerals. Much good mineral may be wasted if these middlings are discarded. In the fine size fractions the discards from the second and third rotors also contain pure clean grains of non-magnetic mineral carried over by mechanical entrapment between magnetic grains. A study of the problem, mechanically and economically, may show that it is worth while to retreat the middlings. If so, the coarse middlings may be reground to release more clean mineral and the reground product either returned to the mill feed or retreated in a separate separator. Regrinding of the fine middlings would probably result in too much fine dust, but simple reseparation without regrinding may recover a worth-while amount of good material from the mechanically entrapped grains.

If the separator feed is not sized the middlings from the second and third rotors probably cannot be reground without making too much fine dust, unless the middlings are screened and only the coarser portion reground.

Sometimes it may pay to crush too coarse, deliberately (to avoid making fines), divide into size fractions for separation, and make a high percentage of coarse middlings. These can then be reground and retreated with the fine sizes. This may result in a worth while gain in separator capacity and reduced losses caused by dust.

The disadvantages of sizing of feed are:

(1) Less flexible operation,—more separators may be required to reserve at least one for each size.
(2) More screens required, meaning more first cost and more maintenance cost.
(3) More head room or more elevators or both, to arrange for feed to and discharge from the screens.
(4) Fine screening is slow and expensive; screen surfaces blind and wear out quickly if ore is abrasive.
(5) It is difficult to keep screens in balance with separators, especially if feed is not very uniform in screen test. One size fraction may run in too large volume for its separator and another size fraction may not give enough feed for its separator.
(6) Unless dust is removed from the feed the finest dust collects in the finest size fraction and may so increase the percentage of dust in that fraction that good separation becomes difficult or impossible. The presence of coarser grains mixed with fines tends to break up clots and make a more free-flowing feed.

The handling of dust is a problem. It has been touched on above. The best solution is to design the crushing flow sheet so that an objectionable amount of dust is not made and, what is just as important, no opportunity is given to permit fines to segregate from coarse and build up in bins, spouts, etc. The finer the crushing before binning the less the danger from segregation, but fines will separate from coarse even on a 20-mesh product. Segregation results in a feed of non-uniform size, first a flood of coarse grains then a flood of fines, which overloads screens and separators and makes efficient separation impossible. Even if the feed is de-dusted the floods of fines overload the air separator used to remove dust and result in a high dust loss or dust in the product.

Today, dust suppression and collection in plants, to avoid dangers of silicosis, is required by the laws of most states. If an adequate dust collection system is provided; if crushing is done so as to minimize the production of fines; if segregation is not permitted; and if the most efficient types of magnetic separators are used; the dust problem with most ores, in so far as it effects magnetic separation, can usually be handled without de-dusting the feed.

Effect of Heat on Separator Efficiency

Whether or not the heating of separator feed generally increases efficiency has never been fully explored. Operators differ on the subject. It is a well known fact that the roasting of certain minerals, pyrite and limonite for example, greatly increases their magnetic susceptibility, but in such cases roasting actually changes the chemical composition. But heating moderately and feeding the ore to the separator while still hot seems to improve recoveries of some minerals. It is certain that a perfectly dry feed separates better than an even slightly damp one. It flows more freely and uniformly and fine dust does not clog and stick as badly. But dryness alone does not always insure best operating conditions. Operators have observed that bone dry feed, if allowed to settle and pack down in bins, especially in cold weather and with high fines, becomes "dead" and "clammy." It does not flow, feed or separate nearly as well as the same feed if allowed to come direct from the dryer, grinding mill, etc., without stopping.

Taggart[4] states, ".... research makes it appear probable that (magnetic) permeability is due to molecular structure rather than to chemical composition. Heat affects permeability, usually decreasing it, but a ferruginous blende is cited that was readily separable when warm but separable with difficulty when cold." Gunther[1] says, "The crystalline form of a compound has an effect on its magnetic properties, as has also water of crystallization. The temperature at which separation takes place also exercises an influence."

In the writer's experience certain minerals were not readily removed magnetically when an ore was fed cold, but when fed hot most of the objectionable minerals were extracted. Also the recovery was higher and the finished product was lower in iron. In mill practice an attempt was made to heat the feed by placing electrical heating elements in the feed hopper of a separator. Efficiency seemed to be improved, but other factors did not remain constant, and the heating elements burned out before a good test run could be obtained. Experiments have not yet been resumed.

Iron Added in Milling

The iron present in a crushed or pulverized mineral product almost always comes from at least two and sometimes three sources. First, there is the iron originally present in the rock in mineral form. Second, there is the abraded iron added from iron and steel crushing and grinding surfaces. Third, there may be additional abraded iron and iron rust from cars, bins, chutes, and pipes with which the ore may come in contact, or from rust-laden water which may flow or drip into the ore in bins, cars, chutes, etc. Often the mineral iron originally in the ore is easier to remove than the iron incidentally added in milling processes. This is because the incidental added iron is usually present in an extremely finely divided form and more or less uniformly distributed throughout the ore mass.

On a strictly mathematical basis some observers dismiss this problem of incidental added iron as of no importance. They argue that to add even 0.01 percent metallic iron to an ore means 20 lb. of abraded iron for each 100 tons of ore crushed and ground, and that is a much higher wear loss than is ever found in good milling practice. This is partly true, although if the wear losses for several crushers, rolls, screens, ball mills, bucket elevators, chutes, etc., per 100 tons of ore milled were added to iron rust from steel bins, pipes, etc., an iron addition of 20 lb. might not be absurdly high for some mills. But iron in a finished product is usually figured as Fe_2O_3 not as pure iron. Our 0.01 percent Fe becomes nearly 0.015 percent Fe_2O_3. Incidentally, probably microscopic grains of iron "sand-papered" off of iron grinding surfaces almost immediately oxidize to FeO or Fe_2O_3 or one of the hydrous oxides. These extremely fine grains are in the worst possible condition for magnetic separation. They either stick to larger grains of pure mineral and go with them into the finished product or make the good particles so magnetic that they will go into the tailings, or they mix with the fine dust and, by mechanical entrainment, carry good dust grains into the tailings.

When it is important to make a very low iron product, at a high production rate and with a low tailings loss, it is a very wise precaution to use as few as possible of iron or steel grinding surfaces, steel lined bins, spouts, gates,

(Continued on page 49)

Pretreating Aggregates For Bituminous Paving

By BROR NORDBERG

Cold laid asphaltic concrete was specified by the United States Navy for construction of new airport runways at the Norfolk, Va., Naval Base, and the contractors elected to furnish material of a comparatively new type. The process consists of treating the aggregate, in this case air-cooled blast furnace slag, with a waterproofing agent before the application of asphalt.

The contractors, F. D. Cline and Leon Ellis, Greensboro, N. C., erected an asphalt plant at the site, which differs only slightly from those operated by many producers of aggregates, to furnish 300,000 sq. yd. of wearing surface, 1½-in. thick, which represents a production of 22,500 tons of material. The surface was laid over a 6-in. thick base coarse of waterbound slag macadam.

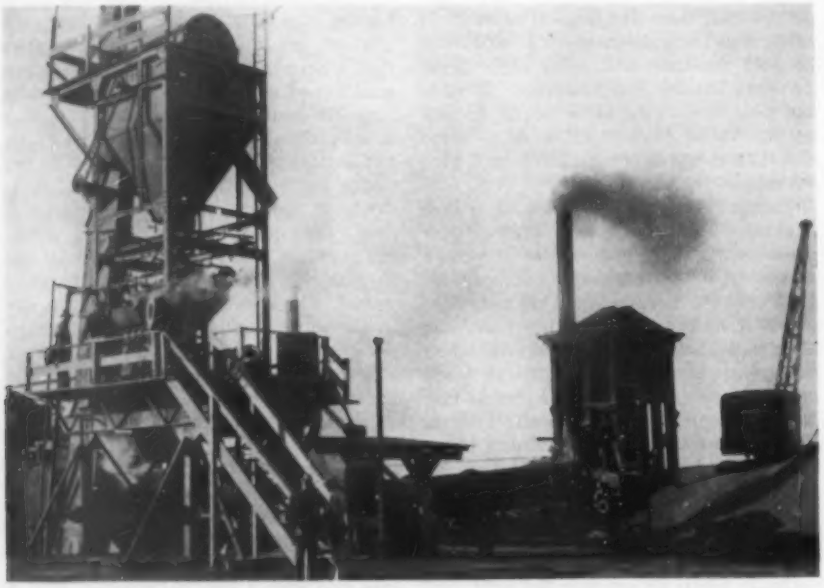
This aggregate waterproofing process, designated Sealdrok by the originator, American Sealdrok, Inc., Chicago, Ill., has been used in producing road construction material which has already seen considerable service, particularly in the East. The waterproofing compound, composed of liquid asphalt and petroleum distillate prepared by special formula, is being used in lieu of liquifier and hydrated lime in treating the graded slag before applying the cutback asphalt.

Waterproofing is applied to prepare the aggregate (slag in this case) for more perfect bonding and keying to the asphalt cement. This is accomplished in part by first removing all surface moisture of the aggregate and practically all contained moisture, which, if not removed, may often be responsible for stripping in service, and then applying the compound. The compound, which is available at oil refineries, consists of an asphalt base of 55 to 60 percent and penetrating elements which permit the aggregate to absorb it in part, leaving a thin film of asphalt on the surface to which the cut-back asphalt adheres.

It has already been proved that the waterproofing compound is readily absorbed by other types of aggregates as well as slag and that by its use there are economies in the percentage of asphalt that need be applied. On the aggregate surface the waterproofing compound forms about one percent of the coating of asphalt specified, and when the cutback product is applied will "take" an amount less than that which is applied when mixed with unprocessed aggregates and liquifier, according to the originators of the process.

Tests conducted by independent laboratories on aggregates treated with the compound have disclosed favorable results, when compared to untreated aggregates, for durability as measured by soundness tests, for bond between standard bituminous cements and the surfaces of aggregates, and as an effective water-proofing pretreatment before mixing with bituminous cement.

From the standpoint of producers of aggregates, an opportunity is afforded to coat graded aggregates with the compound for later delivery to contractors and other consumers who desire a dry, moisture-proof aggregate which is ready to be coated with asphalt. It is claimed that such aggregates, when properly treated, can be stored indefinitely without the loss of their water-proofing qualities. The availability of such products would be of value in producing asphalt road material regardless of weather conditions.



Asphalt plant of F. D. Cline and Leon Ellis where slag is pre-coated with waterproofing compound before the application of asphalt. The cylindrical dryer on right is fired by fuel oil to drive off moisture. After drying, the slag is cooled through the revolving drum on left to about 150 deg. F. and the compound and asphalt are then applied in the mixer

Dry and Treat Slag Without Storing By Using Cooler

On the Naval Base project, it was specified that construction be governed so that there would be no interference with normal operation of the flying field. In order to fulfill terms of the contract, the slag was dried and treated in straight-line production without provision for storage of water-proofed aggregates. The asphalt was applied directly after the slag had been thoroughly coated with Sealdrok, although the contractors had satisfied themselves by experiments that, should they so desire, water-proofed aggregates could be stored for later use. By selection of the process, an 85-100 penetration cutback asphalt is being used successfully and the final product has proved to have good workability when laid.

Except for the addition of a cylindrical cooler to reduce the temperature of slag discharged from the drier before the application of the waterproofing compound, the plant set up was similar to those which had been used by the contractors on other jobs. This added equipment, of course, would not have been necessary had there been sufficient time and adequate storage provided for stocking dried aggregates before the application of the waterproofing. The cooler speeded up operations, and the additional cost was offset in asphalt savings.

Crushed slag was shipped from the Maryland Slag Co. plant at Sparrows Point, Md., in barges which carry 2200

Airport runways at Norfolk Navy Yard being laid with asphaltic concrete trucked directly from the mixing plant. The machine places the material by a combination of spreading and tamping. The project required 300,000 sq. yd. of material placed 1½ in. thick

tons, and unloading was done by means of a 2½-cu. yd. Bucyrus-Erie crane and a 1-cu. yd. Speedcrane, both gasoline-driven, into batching bins located at pier 7 in the Navy yard. The barges were unloaded at the rate of 100 tons per hour and the slag, minus ¾-in. size, was trucked to the site of the plant.

A Lorain 40 with ¾-cu. yd. bucket was used to place the slag into a bin over a 44-in. by 37-ft. revolving drum dryer. The dryer, fired with fuel oil, has internal blades, or lifters, to raise and drop the slag as it travels toward the discharge end. Temperature of the slag at the discharge end was carried at 250-300 deg. F. to insure the driving off of all surface moisture and to reduce the contained moisture to less than 0.4 percent.

Feed Varied in Accordance With Moisture Content

While the dryer speed was constant, the feed of slag was varied to maintain the desired slag temperatures for varying moisture conditions. The slag flowed by gravity from the bin through a chute into the dryer, and the 14-in. square throat was regulated by slide gate to control the rate of feed. Moisture in the stockpiled slag averaged from three to six percent. The wide variance in moisture conditions was the limiting factor in the plant's ability to produce asphaltic concrete.

Upon discharge from the dryer, the slag was carried by chain bucket elevator and passed through a 36-in. by 28-ft. revolving drum-type cooler where the slag temperatures were reduced to about 150 deg. F. preparatory to applying the waterproofing.

The cooler, designed similar to the dryer, cooled the slag by raising and dropping it within the drum to give the greatest possible access to air. No induced draft was found necessary. Discharge from the cooler was into a chain-bucket elevator, the slag being split at ¼-in. over a vibrating screen directly above a 20-ton partitioned bin. The coarse material, ¼-in. to ¾-in., was placed in one bin and ¼-in. minus slag in the other compartment, and drawn in definite proportions to give the desired gradation upon discharge into a 2-ton double-blade pug mixer.

About 75 percent of the aggregate was ¼- to ¾-in. slag, which was drawn through a swing gate into the mixer. The Sealdrok waterproofing compound was then applied in the mixer box. Sealdrok was obtained from a local oil refinery and trucked to the plant, where it was pumped by a steam pump into a pipeline over the mixer box, and sprayed uniformly over the coarse slag. The maximum specified, or 1½ percent of Sealdrok, was used on this particular job, to insure adequate penetration into the aggregate, which is, of course, more porous and cellular than either gravel or crushed stone. The fine aggregate, or screenings, was then introduced and the mass was mixed from ½ to 1 minute to insure uniform and complete coating of each particle.

The next step was to introduce the 85-100 penetration cut-back asphalt into the mixer. Asphalt was shipped to the site in tank cars and stored in steam-jacketed tanks. A steam pump forced the asphalt, heated from 175 to 200 deg. F., into a separate weigh batcher next to the pug mill. After proper proportioning it was discharged into the mixer and the entire mass was mixed for from 1 to 2 minutes. Aggregates were weighed by a Kron scale and a second scale of the same type weighed the asphalt.

About 4½ percent of asphalt was used, or 90 lb. to the ton, to give a thorough coating and a workable mix. If stone or gravel had been used in place of slag, the asphalt which would be "taken" up in mixing would be reduced to about 3½ percent. It is not unusual for cold mix designs to require in the neighborhood of 130 lb. of asphalt to the ton when the aggregate is untreated previously to the application of the asphalt. To prevent chilling the mixture, the mixing box was steam jacketed and the prepared material was delivered on the job at about 90 deg. F. in 4-ton trucks. The asphaltic concrete was laid by a Barber-Greene machine which spreads and tamps the material into place. Capacity of the plant averaged about 45 tons per hr. dependent on moisture conditions. The finished runways are designed to provide a surface having highly desirable non-skid qualities and will withstand severe impact stresses from landing planes.

W. C. Medlin, representative of the contractor, was in general charge of construction and H. S. Titman was foreman of the asphalt plant.

THE KANSAS SAND CO., Topeka, Kan., suggested to the city commission that a section of the proposed new dike on the north side of the Kaw River be rerouted so that it would pass to the north of the main structures of the company, instead of cutting through the group. The company stated, "we believe it would reduce our damage from more than $100,000 to something less than $25,000."

Airport runways at Norfolk Navy Yard being laid with asphaltic concrete trucked directly 2200 ton barges. On pier No. 7 at the Navy Yard cranes unload the slag into batching bins tamping. The project required 30,000 sq. yd. of material placed 1½ in .thick

Preventing Kiln Troubles By Finding Cause

Part 2

By W. S. DICKIE*

Before going into the various troubles encountered and the cures applied in connection with the operation of a rotary kiln, it might be interesting to give a little information on the shipment to destination of the necessary material making up a kiln, the various methods of loading and unloading these parts, the different methods used in erecting the kiln, and the alignment of a new kiln before starting.

Shipment of shells is usually made on flat cars. The maximum size of shell section shipped is governed by railroad clearances. This is mutually advantageous for the kiln manufacturer as well as buyer. Depending again on the clearances, the tires and gear ring are shipped either attached to the shell or separately. All of the underneath parts such as supporting bearings, thrust bearings, and driving gear, together with firing hood or any other appurtenances, are usually shipped in flat cars or low side gondolas.

The method of unloading the shell is always governed by local conditions. Probably the ideal arrangement would be to have a railroad siding parallel with the proposed location of the kiln and roll or skid the shell to its position. Sometimes this is impossible, and it is necessary to roll the shell a considerable distance over a skidway and perhaps at the same time turn it at 90 deg. Other times it is possible, under conditions where a siding is rather close and parallel to the foundations, to move the kiln off the cars, jack it up to the proper height, blocking underneath the shell as it progresses in jacking, and roll it a very short distance from the blocking to its position. Other times it is found profitable to use extremely heavy railroad or bridge cranes, picking up the shell directly from the cars on which it has been transported and lifting it to its position on the foundation.

*Engineer in charge, Cement, Lime and Chemical Equipment, Vulcan Iron Works, Wilkes-Barre, Penn.

Preventing Distortion In Mounting Kiln Shell

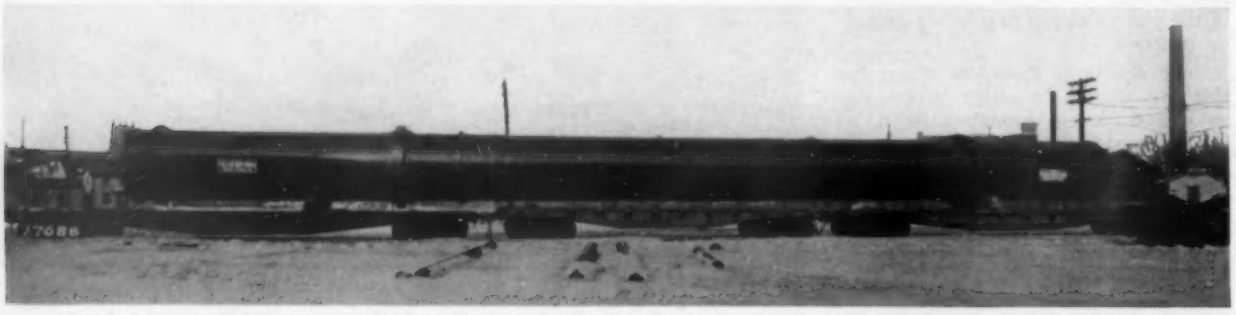
Regardless of the method of unloading and placing the shell, the supporting roller bearings and the driving gear must have already been set on their respective foundations, loosely perhaps, but preferably aligned and shimmed to their proper position. In all cases in the preceding paragraph where it was said that the kiln should be moved to its position, it was intended that the shell be dropped on the supporting rollers which had already been placed. In the event that the tires and gear ring had to be shipped separately, it is a decided advantage to mount these parts on the shell in their proper position on the ground, if it is possible, and move the kiln shell up to its proper position after these parts have been assembled with it.

In the case where kilns are too long for the shell to be shipped in one section and, therefore, must be shipped in shorter sections, it has been considered an advantage to raise from the ground as long a section as is possible. Consequently, it has been considered good practice to put sections together on the ground before raising to position. Neither of these rules can be set and hard since local conditions again govern, and many instances are known where rather short sections were raised to position and the connections made high up in the air. Great care should be used when jacking, rolling, or hoisting the shell or shell sections to their proper position so that the shell is not distorted. Usually, rolling the shell is accomplished by means of a snubbed line and, if the pitch on which the shell must be rolled is great enough, it is possible to make an appreciable dent in the shell. The use of narrow timbers for either rolling or blocking is to be avoided for the same reason.

After the kiln has been set up in accordance with the instructions from the manufacturer, it is recommended that it be run several days for a short period before the brick lining is installed because the act of revolving the kiln seems to take out the slight inequalities in the alignment of the shell which might occur in erection. Later on in this series mention will be made of errors in erection, and the results which might be expected through incorrect setting up of the kiln.

Allowance should always be made in the design of the foundations so that there is 2-in. for grouting the various bedplates in position. When setting up, the alignment of these bedplates should be very carefully checked so that they are exactly at right angles to the centerline of the kiln as well as exactly parallel with the pitch. They should then be shimmed to their proper position and, after the shell is placed on the bearings and completely connected, it should be revolved before the grouting-in of the bedplates is done. When the tires and gear ring are shipped separately, extreme care should be taken in assembling the tires as it is just as important to have the plane of the tires exactly at right angles to the centerline of the kiln as it is to have the supporting bearings exactly in position. Usually the support flange for the gear ring is attached in the shop and the gear, when bolted on, automatically comes to its proper position.

Precaution should be taken to keep the shell sections straight when they are



Method of loading kiln shell for transportation is an important factor in preventing distortion

being joined in the event the shell is shipped in two or more sections. It is probably preferable to use a transit in making this alignment but, if there is no transit available, a very straight shell can be attained by using a wooden stand made somewhat along the lines of a carpenter's square with a horizontal mark accurately made on the upright leg on the horizontal centerline of the shell and with a cross indicating the vertical centerline. This stand, or square, can be set up at various points and the kiln revolved. Measurements are taken from the cross mark on the stand to the shell at the four quarters and the alignment determined. It is generally safe to tack a welded field joint or pin a riveted joint because the plates making up the various sections of the shell are accurately planed so that, if the joint is tightly made, the shell is nearly always automatically straight. The shell may be revolved when enough tack welding or pinning is done so that it will sustain the weight of the shell. If it has been determined that the shell is straight, the final welding or the riveting of the joint can be done.

After the shell has been made straight and completely welded or riveted, the rollers of the supporting bearings should be brought to a proper theoretical pitch. Usually there is some mark on the supporting bearing bedplate which should be directly under the vertical centerline of the shell. These marks should be lined up with a transit; but if not, the lining up may be done with a line which should be a piano wire tightly stretched. Then the roller assembly, including roller shaft, and pedestals, should be set equidistant from the centerline mark on the bedplate. The kiln will not then be in adjustment for operating, but it will be in alignment and ready for the adjustment.

All of the above is presuming that the main pinion, which meshes with the gear ring, has been set far enough out of mesh so that there is no danger from breakage. Owing to the fact that a kiln sets on a pitch, it is necessary to "cut" or "cant" the roller assembly at an angle with the centerline of the shell so that all of the end thrust, developed because of the pitch of the kiln, does not have to be taken by the thrust bearings. Equalizing of the "cut" on each one of the roller assemblies is recommended regardless of whether it is a two- or a multiple-tired kiln. The usual method is to adjust all of the roller assemblies the same amount by measuring the amount of turn on the nut of the adjusting screw. After this has been done, the kiln is revolved and the adjustment noted by observing the movement of the tires between the two thrust rollers. More or less adjustment is given on all roller assemblies, depending on what is observed, until the shell just floats between the thrust rollers. The final very small adjustment necessary is made at the set of supporting roller bearings on which the thrust bearing is mounted. Incorrect adjustment of supporting roller bearings shows itself up in several ways which will be described later.

With the kiln properly aligned and properly adjusted, we are now ready to adjust the driving gear. Where molded tooth gears and pinions are used, the main pinion and gear ring should be out of mesh about ⅜-in. at the pitch line. With machine cut teeth on the main pinion and gear ring, this dimension can be reduced to 5/16-in. or even to ¼-in. Again there is great danger if the gear ring and main pinion are too tightly meshed; also to be covered later.

Proper Lubricant Important In Starting Kilns

Starting the kiln is also important. With the newer type of oil-lubricated bearings, the pedestals should be very thoroughly cleaned out before the kiln is moved. An oil lighter in viscosity than is expected ultimately to be needed should be used for a few days. After the bearings have been properly run in, the starting lubricant should be drained out, the bearings flushed, and the oil of the proper viscosity used to fill the bearings. On the older type of cradle or four-roller supports the same thing applies, except grease is used instead of oil. Therefore, a thinner and lighter grease should be used for breaking in the bearings, and grease of the proper viscosity for continuous operation put in only after the kiln has been properly broken in. A good grade of gear lubricant should be used on the teeth of the gears and pinions. It would be an economy not to run any part of the kiln very long without a complete change of lubricant and a thorough flushing out of all the parts.

The usual procedure is to line up and adjust the kiln carefully, and then revolve it long enough to see that everything is right. The grouting is then placed under the bedplates. While the grouting is setting, the lining of the shell with fire brick is started. This automatically gives the grouting enough time to set properly.

With the kiln properly adjusted and aligned, any other parts which are to be mounted on either the shell or the auxiliary details at either end may now be placed in position with the assurance that these parts will fit properly. For example, if the shell is not properly aligned, sealing rings have considerably more duty imposed on them than is intended.

Magnesite and Magnesia Imports Now Big Factor

Magnesite, or $MgCO_3$, is a common constituent of many limestones—which makes them "magnesian limestones," or dolomites if the proportion of $MgCO_3$ amounts to over 40 percent. While limestones composed of relatively pure $CaCO_3$ are fairly common, magnesites composed of relatively pure $MgCO_3$ are rare. Only two states in the United States are known to have commercial deposits—California and Washington.

The chief use of magnesite is for making refractories for open-hearth steel furnaces, and with the growth of the open-hearth process the production of magnesite has expanded. The product made in Washington and California is hard-burned or dead-burned magnesite (magnesia) or a product known as dead-burned ferromagnesite, which is crude crushed magnesite burned in a rotary kiln with 7½ percent of iron in the form of screened mill scale.

These products have to compete with dead-burned dolomite from the Eastern part of the United States, and dead-burned magnesite imported from Austria, and within the last year or two, from Manchuria. The first imports from Manchuria arrived late in 1936, but in 1937, 21,395 tons were imported, an amount almost equal to that received from Austria. American shipments of domestic dead-burned magnesite in 1937 were 83,204 tons. So about half as much is imported as is produced here.

From Sea Water

Magnesium chloride is one of the principal constituents of ocean water, and at Newark, Calif., on San Francisco Bay, in December, 1937, the new plant of the Westvaco Chlorine Products Corporation began to produce various forms of calcined magnesia from sea water bitterns by a chemical process. Its products began moving to eastern markets early in 1938. The first unit has a capacity of 18,000 to 25,000 tons annually and the "Sea-Water" oxide or caustic calcined, two grades of periclase, and standard dead-burned magnesia are said to be equal or superior to corresponding products made from either domestic or foreign magnesites. Whereas natural magnesites cannot economically be freed of certain impurities these process products can be varied in composition at will and uniformity in successive shipments is simply a matter of chemical laboratory control, according to a United States Bureau of Mines report.

FT. LARAMIE CAST STONE PRODUCTS Co., Ft. Laramie, Ohio, is seeking a source of sparkling granite chips for aggregate.

Estimation of Phase Composition of Cement Clinker

Part 6

In the estimation of phase composition it has been found necessary at times to employ negative quantities in expressing the composition of liquids, as in portions of Fig. 13-18. This is due to the fact that, for use in computations, the liquid compositions have been expressed in terms of the components of the system C_2S-C_2S-C_3A-C_4AF or CaO-C_2S-C_3A-C_4AF, although it is actually in the system C_2S-C_3A-C_5A_3-C_4AF. Such a liquid, if crystallizing alone, will form C_2S, C_3A, C_5A_3 and C_4AF, when crystallization is complete. On the other hand, when the liquid is present as one of the phases in a mixture which is in the system C_2S-C_2S-C_3A-C_4AF, chemical reactions occur, so that in the normal course of crystallization the final products do not include C_5A_3.

If the chemical reactions between the solid phases and liquid occur at a negligible rate as a mixture is cooled from a given temperature, crystallization does not stop, but takes a different course, the liquid crystallizing as it would by itself. It is then said to crystallize independently.[3] If complete independent crystallization occurs, the liquid forms the quantities of C_2S, C_3A, C_5A_3 and C_4AF which would form if it crystallized alone. If the phase composition when independent crystallization begins is known, the composition with complete independent crystallization is found by adding to the solid phases present at the beginning, the solid phases formed by independent crystallization of the liquid. To perform this computation, it is necessary to convert the liquid composition into terms of C_2S, C_3A, C_5A_3 and C_4AF. From Figs. 13-18, the liquid composition is found in terms of C_3S, C_2S, C_3A and C_4AF, with C_3S negative, or in terms of CaO, C_2S, C_3A, C_4AF, with CaO negative. These may be converted to the desired basis by applying the following equations, in which the subscript 1 denotes the values in the composition obtained from Fig. 13-18, and the subscript 2 denotes the desired values.

Transformation from system C_2S-C_2S-C_3A-C_4AF

$$(C_2S)_2 = (C_2S)_1 + 0.7544\,(C_3S)_1 \quad \ldots (18)$$

$$(C_3A)_2 = (C_3A)_1 + 0.8876\,(C_3S)_1 \quad \ldots (19)$$

$$(C_5A_3)_2 = -0.6419\,(C_3S)_1 \quad \ldots (20)$$

$$(C_4AF)_2 = (C_4AF)_1 \quad \ldots (21)$$

Transformation from system CaO-C_2S-C_3A-C_4AF[3]

$$(C_2S)_2 = 0.7544\,(C_3S)_1 \quad \ldots (22)$$

$$(C_3A)_2 = (C_3A)_1 + 3.6133\,(CaO)_1 + 0.8876\,(C_3S)_1 \quad \ldots (23)$$

$$(C_5A_3)_2 = -2.6133\,(CaO)_1 - 0.6419\,(C_3S)_1 \quad \ldots (24)$$

$$(C_4AF)_2 = (C_4AF)_1 \quad \ldots (25)$$

To illustrate the procedure, let us assume that mixture M (54% C_3S, 25% C_2S, 12% C_3A, 9% C_4AF) attains equilibrium at 1400 deg. C., and is then cooled, with the liquid crystallizing independently. It has been found (Rock Products, Dec. 1938, p. 47) that when this mixture is at equilibrium at 1400 deg. C. it is composed of 56.7% C_3S, 17.7% C_2S, and 25.6% liquid, the liquid having the potential composition, -10.5% C_3S, 28.5% C_2S, 47.0% C_3A, 35.0% C_4AF.

Equations 18-21 are applied to the liquid composition as shown below:

	Percent
C_2S = 28.5 + 0.7544 (—10.5)	= 20.6
C_3A = 47.0 + 0.8876 (—10.5)	= 37.7
C_5A_3 = —0.6419 (—10.5)	= 6.7
C_4AF = 35.0	35.0
	100.0

The liquid is 25.6 per cent of the mixture at 1400 deg. C. The percentages obtained above are therefore multiplied by 0.256, to obtain the percentages of products of independent crystallization to be added to the solid phases present at 1400 deg. C., as follows:

	Percent
C_3S =	56.7
C_2S = 17.7 + 0.256 x 20.6 =	23.0
C_3A = 0.256 x 37.7 =	9.6
C_5A_3 = 0.256 x 6.7 =	1.7
C_4AF = 0.256 x 35.0 =	9.0
	100.0

In calculating phase composition with independent crystallization Lea and and Parker[3] proceeded on the same assumption as in the above computations, that is, assuming complete independent crystallization after a state of equilibrium has been attained at a particular temperature at which liquid is present.

Arrested Independent Crystallization

In the foregoing computations it has been assumed that crystallization is complete but that the liquid crystallizes independently. This is the assumption in Lea and Parker's calculations of phase composition with independent crystallization[3]. Another possibility exists, that crystallization may occur independently, but may not be complete. Estimation of the phase composition of the product obtained under this condition will not be discussed in detail. Attention is called to the possibility of the occurrence of arrested independent crystallization, however, as it has considerable bearing upon the question of the existence of C_5A_3 as a product of independent crystallization.

In the independent crystallization of liquids in the system C_2S-C_3A-C_5A_3-C_4AF, solid C_5A_3 is the last solid phase to appear, and does so only when the percentage of liquid is very small. Thus, if independent crystallization is not complete, so that the cooled product contains an appreciable quantity of glass, solid C_5A_3 will usually be absent. The fact that C_5A_3 is seldom observed

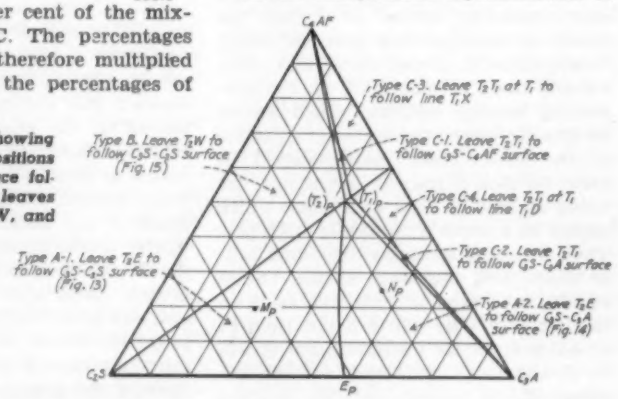

C4AF
Type C-3. Leave T2T1 at T1 to follow line T1X
Type B. Leave T2W to follow C3S-C2S surface (Fig. 15)
Type C-1. Leave T2T1 to follow C3S-C4AF surface
Type C-4. Leave T2T1 at T1 to follow line T1D
Type C-2. Leave T2T1 to follow C3S-C3A surface
Type A-1. Leave T2E to follow C3S-C2S surface (Fig. 13)
Type A-2. Leave T2E to follow C3S-C3A surface (Fig. 14)
C2S
C3A
Ep

Fig. 12 — Diagram showing classification of compositions with reference to surface followed when liquid leaves quintuple lines T_2E, T_2W, and T_2T_1

TABLE 4—CLASSIFICATION KEY—SYSTEM C_2S-C_2S-C_3A-C_4AF

	Type
C/D exceeds 0.64	
B/D exceeds 0.32	
C/D exceeds 3.33	
B/D exceeds 2.40	
B/C exceeds 0.72	A-1
B/C less than 0.72	A-2
B/D less than 2.40	A-2
C/D less than 3.33	
B exceeds (0.77C-0.17D)	A-2
B less than (0.77C-0.17D)	A-2
B/D between 0.28 and 0.32	C-2
B/D less than 0.28	C-4
C/D less than 0.64	
B/C exceeds 0.50	B
B/C between 0.43 and 0.50	C-1
B/C less than 0.43	C-3

In the System $3CaO.SiO_2$-$2CaO.SiO_2$-$3CaO.Al_2O_3$-$4CaO.Al_2O_3.Fe_2O_3$ at Clinkering Temperatures

By L. A. DAHL

Research Chemist, Portland Cement Association, Chicago, Ill.

in cement clinker is therefore not to be regarded as evidence that independent crystallization does not occur.

Simplified Calculation of Phase Composition

Estimation of phase composition by the graphic methods previously described is rather tedious and requires constant attention to the course of change in liquid composition during fusion or crystallization. A simplified procedure will now be presented.

It has been shown that when the liquid phase is on a boundary surface between primary phase volumes, the relative proportions of the absent phases, that is, the phases not capable of existing in equilibrium with the liquid, are identical in the potential compositions of mixture and liquid. This leads to complex relations between percentages of the oxides, except in the case of liquids on the C_3S-C_2S and CaO-C_3S surfaces. Classification of compositions as to type, and equations for direct computation of phase composition are consequently more simple when composition is expressed in terms of percentages of C_3S, C_2S, C_3A and C_4AF. In the classification key, Table 4, and the equations for calculating phase composition, Table 5, the symbols A, B, C, and D represent potential percentages of C_3S, C_2S, C_3A and C_4AF respectively in any mixture (or cement clinker) under consideration. When a particular mixture is considered, the first step in the simplified procedure is therefore the conversion of the composition into these terms. This may be accomplished by substitution in Equations 1-5, or by the use of a slide-rule or nomogram designed for computation of the potential compound composition of portland cement.

The equations to be used in calculating phase composition depend upon the type to which the composition belongs. The second step in the procedure is therefore to classify any composition under consideration as to type. This may be accomplished by the method described in the discussion of Fig. 12. A more convenient method, however, is given in the classification key, Table 4.

In Table 4, compositions are separated into two main classes: (1) those in which the C_3A/C_4AF ratio is greater than 0.64, corresponding to Lea and Parker's type (a) cements; (2) those in which the C_3A/C_4AF ratio is less than 0.64, corresponding to their type (b). Each of these is divided into three subclasses. For example, the first class is divided into sub-classes depending upon the C_2S/C_4AF ratio, whether less than 0.28, between 0.28 and 0.32, or greater than 0.32. This process is repeated until each of the final sub-classes includes only one composition type. By the use of the classification key, the type to which any given composition belongs may be determined without referring to Fig. 12.

The classification in Table 4 is not absolutely identical with that in Fig. 12, because it was developed by treating the curve T_2E as made up of two straight lines, instead of a curve. This procedure leads to simple expressions in the classification key, and introduces only a negligible error. A similar procedure applied to the various curves in the system was followed in deriving the equations in Tables 5 to 7.

Having determined the type to which a given composition belongs, the various series of equations which apply to that type may be found by referring to the first column of Table 5. For exam-

TABLE 5—EQUATIONS FOR CALCULATING PHASE COMPOSITION DURING THE PROCESS OF FUSION, AND THE PRODUCTS OF COMPLETE INDEPENDENT CRYSTALLIZATION

Type	Series	At Equilibrium	Independent Crystallization	Approx. Temp.
		Liquid at T_2 (1338°)		
A-1 A-2	1	$C_3S = A—0.03D$ $C_2S = B—0.32D$ $C_3A = C—0.64D$ Liquid = 1.99D	———	
B	2	$C_3S = A—0.04C$ $C_2S = B—0.50C$ $C_4AF = D—1.56C$ Liquid = 3.10C	———	
C-1 C-2 C-3 C-4	3	$C_3S = A—0.08B$ $C_3A = C—1.99B$ $C_4AF = D—3.11B$ Liquid = 6.18B	———	
		Liquid Arriving at T_1 from line T_1T_2. (1341°C.)		
C-3 C-4	4	$C_3S = A—0.27B$ $C_3A = C—2.33B$ $C_4AF = D—3.63B$ Liquid = 7.23B		
		Liquid Leaving T_1 on Line T_1X. (1341°C.)		
C-3	5	CaO = 0.14C—0.33B $C_3S = A+1.33B—0.68C$ $C_4AF = D—1.56C$ Liquid = 3.10C	CaO = 0.14C—0.33B $C_3S = A+1.33B—0.57C$ $C_2S = 0.43C$ $C_3A = C$ $C_4AF = D$	
		Liquid Leaving T_1 on Line T_1D. (1341°C.)		
C-4	6	CaO = 0.09D—0.33B $C_3S = A+1.33B—0.44D$ $C_3A = C—0.64D$ Liquid = 1.99D	CaO = 0.09D—0.33B $C_3S = A+1.33B—0.37D$ $C_2S = 0.28D$ $C_3A = C$ $C_4AF = D$	
		Liquid Leaving T_2E to Follow C_3S-C_2S Surface		
	C/D 0.64 to 0.66	7	$C_3S = A+0.65C—0.44D$ $C_2S = B+0.17D—0.77C$ Liquid = 1.12C+1.27D		1436 — 195D / L
A-1	0.68 to 3.33	8	$C_3S = A+0.65C—0.44D$ $C_2S = B+0.17D—0.77C$ Liquid = 1.12C+1.27D	$C_3S = A+0.65C—0.45D$ $C_2S = B+0.34D—0.49C$ $C_3A = 0.42C+0.40D$ $C_3A_3 = 0.42C—0.29D$ $C_4AF = D$	1436 — 195D / L
	More than 3.33	9	$C_3S = A+0.58C—0.19D$ $C_2S = B—0.72C$ Liquid = 1.14C+1.19D	$C_3S = A+0.58C—0.19D$ $C_2S = B+0.15D—0.44C$ $C_3A = 0.49C+0.17D$ $C_3A_3 = 0.37C—0.13D$ $C_4AF = D$	1455 — 290D / L

ple, if it is found that a composition in question is of type B, the equations in series 2 apply. Similarly, series 13, 14 or 15 applies, the choice depending upon the C_3A/C_4AF ratio, as indicated in the second column. Series 16 or 17 and 21 or 22, may apply, depending in each case upon the C_3A/C_4AF ratio.

In the last column of some sections of Table 5, equations are given for estimation of the approximate temperature at which the state of equilibrium represented in that section occurs. In these equations, L represents the per cent of liquid found from the equation for liquid in the same series. For example, consider mixture P, 52% C_3S, 24% C_2S, 15% C_3A, 9% C_4AF. Referring to Table 4, it is found to be of type A-1. Equation 8 is one of the equations which apply, since the C_3A/C_4AF ration is 1.67. The per cent of liquid is 1.12 x 15 + 1.27 x 9, or 28.2 per cent. The approximate temperature is 1436 — 195 x 9/28.2, or 1374 deg. C. This is approximately the temperature at which the liquid in mixture P leaves the quintuple line T_2E to follow the C_3S-C_2S surface. If equilibrium is attained at this temperature, the mixture will be composed of 57.7% C_3S, 14.0% C_2S, 28.2% liquid, as found from the first set of equations in series 8. If quenched at this temperature, the phase composition will be the same, with glass substituted for liquid. If cooled from this temperature, and if complete independent crystallization occurs, the mixture will be composed of 57.7% C_3S, 19.7% C_2S, 9.9% C_3A, 3.7% C_5A_3, 9.0% C_4AF, as found from the second column of equations in Series 8.

Disposition of Magnesia and Alkalies in Cement Clinker

All of the foregoing computations are based upon the assumption that a mixture under consideration is composed only of CaO, Al_2O_3, SiO_2, and Fe_2O_3, no other oxides being present. This is because of the fact that the data obtained from the investigation of the quaternary system CaO-Al_2O_3-SiO_2-Fe_2O_3 refer only to such compositions. Commercial portland cement clinker does not meet this condition, although the additional oxides, such as magnesia and the alkalies, are usually present in small proportions.

Lea and Parker[8] state that, although the effect of the addition of magnesia and the alkalies upon the liquid content can not be evaluated exactly, the increase in liquid is of the order of the percentages of magnesia and the alkalies. Thus, the percentages of these oxides may be added to the percentage of liquid found by calculation, to obtain a closer approximation to the true liquid content. This is about the best that can be done until further information is available. It should be modified by in-

TABLE 5 (Continued)—EQUATIONS FOR CALCULATING PHASE COMPOSITION

Type	Series	At Equilibrium	Independent Crystallization	Approx. Temp.
		Liquid Leaving T_2E to Follow C_3S-C_2A Surface		
	B/D			
	0.32	$C_3S = A + 0.85B - 0.30D$		$1436 - \frac{195D}{L}$
	to 10	$C_2A = C - 1.30B - 0.23D$		
	0.35	Liquid $= 1.45B + 1.53D$		
A-2		$C_3S = A + 0.85B - 0.30D$	$C_3S = A + 0.85B - 0.30D$	$1436 - \frac{195D}{L}$
	0.35	$C_2A = C - 1.30B - 0.23D$	$C_2S = 0.36B + 0.22D$	
	to 11	Liquid $= 1.45B + 1.53D$	$C_3A = C + 0.27D - 0.75B$	
	2.40		$C_5A_3 = 0.54B - 0.19D$	
			$C_4AF = D$	
	More	$C_3S = A + 0.80B - 0.19D$	$C_3S = A + 0.80B - 0.19D$	$1455 - \frac{290D}{L}$
	than 12	$C_2A = C - 1.39B - 0.01D$	$C_2S = 0.40B + 0.14D$	
	2.40	Liquid $= 1.59B + 1.20D$	$C_3A = C - 0.71B + 0.17D$	
			$C_5A_3 = 0.51B - 0.12D$	
			$C_4AF = D$	
		Liquid Leaving T_2W to Follow C_3S-C_2S Surface		
	C/D			
	0.0 13	$C_3S = A + 0.11C - 0.30D$	$CaO = 0.004D - 0.04C$	$1320 + \frac{36D}{L}$
	to	$C_2S = B + 0.01D - 0.12C$	$C_3S = A + 0.16C - 0.016D$	
	0.10	Liquid $= 1.01C + 1.29D$	$C_2S = B + 0.012D - 0.12C$	
			$C_3A = C$	
			$C_4AF = D$	
	0.10	$C_3S = A + 0.33C - 0.32D$		$1320 + \frac{36D}{L}$
B	to 14	$C_2S = B - 0.40C + 0.04D$		
	0.34	Liquid $= 1.07C + 1.28D$		
	0.34	$C_3S = A + 0.60C - 0.41D$		$1320 + \frac{36D}{L}$
	to 15	$C_2S = B + 0.15D - 0.74C$		
	0.64	Liquid $= 1.14C + 1.26D$		
		Liquid on 1400° Isotherm, C_3S-C_2S Surface*		
	C/D			
	0.0	$C_3S = A + 0.15C - 0.42D$	$CaO = 0.016D - 0.06C$	
B	to 16	$C_2S = B + 0.05D - 0.19C$	$C_3S = 0.25C - 0.065D$	
	0.26	Liquid $= 1.04C + 1.37D$	$C_2S = 0.049D - 0.19C$	
			$C_3A = C$	
			$C_4AF = D$	
	0.26	$C_3S = A + 0.62C - 0.54D$		
	to 17	$C_2S = B + 0.20D - 0.76C$		
	0.64	Liquid $= 1.14C + 1.34D$		
	0.64	$C_3S = A + 0.66C - 0.57D$		
	to 18	$C_2S = B + 0.21D - 0.77C$		
	0.86	Liquid $= 1.11C + 1.36D$		
	0.86	$C_3S = A + 0.66C - 0.57D$	$C_3S = A + 0.66C - 0.57D$	
A-1	to 19	$C_2S = B + 0.21D - 0.77C$	$C_2S = B + 0.43D - 0.50C$	
	3.33	Liquid $= 1.11C + 1.36D$	$C_3A = 0.41C + 0.51D$	
			$C_5A_3 = 0.43C - 0.37D$	
			$C_4AF = D$	
	3.33	$C_3S = A + 0.67C - 0.62D$	$C_3S = A + 0.67C - 0.62D$	
	to 20	$C_2S = B + 0.22D - 0.77C$	$C_2S = B + 0.47D - 0.51C$	
	4.71	Liquid $= 1.10C + 1.40D$	$C_3A = 0.40C + 0.55D$	
			$C_5A_3 = 0.44C - 0.40D$	
			$C_4AF = D$	
		Liquid on 1450° Isotherm C_3S-C_2S Surface**		
	C/D			
	0.0	$C_3S = A + 0.48C - 0.54D$	$CaO = -0.21C + 0.03D$	
	to 21	$C_2S = B - 0.64C + 0.11D$	$C_3S = A + 0.85C - 0.14D$	
	0.16	Liquid $= 1.16C + 1.43D$	$C_2S = B - 0.64C + 0.11D$	
			$C_3A = C$	
			$C_4AF = D$	
B				
	0.16	$C_3S = A + 0.48C - 0.54D$		
	to 22	$C_2S = B - 0.64C + 0.11D$		
	0.64	Liquid $= 1.16C + 1.43D$		
	0.64	$C_3S = A + 0.60C - 0.61D$		
	to 23	$C_2S = B - 0.72C + 0.16D$		
	1.03	Liquid $= 1.12C + 1.45D$		
	1.03	$C_3S = A + 0.60C - 0.61D$	$C_3S = A + 0.60C - 0.61D$	
A-1	to 24	$C_2S = B - 0.72C + 0.16D$	$C_2S = B - 0.45C + 0.46D$	
	3.33	Liquid $= 1.12C + 1.45D$	$C_3A = +0.47C + 0.54D$	
			$C_5A_3 = +0.38C - 0.39D$	
			$C_4AF = D$	
	3.33	$C_3S = A + 0.64C - 0.73D$	$C_3S = A + 0.64C - 0.73D$	
	to 25	$C_2S = B - 0.75C + 0.24D$	$C_2S = B - 0.48C + 0.55D$	
	12.50	Liquid $= 1.11C + 1.49D$	$C_3A = +0.43C + 0.65D$	
			$C_5A_3 = +0.41C - 0.47D$	
			$C_4AF = D$	

Type	Series	At Equilibrium	Independent Crystallization	Approx. Temp.
Liquid Leaving C_2S-C_2A Surface to Follow T_1D				
	B/D			
	0.28	$C_2S = A + 0.79B - 0.29D$		149D
	to 26	$C_2A = C - 1.66B - 0.18D$		1416 —
	0.37	Liquid $= 1.87B + 1.47D$		L
A-2	0.37	$C_2S = A + 0.79B - 0.29D$	$C_2S = A + 0.79B - 0.29D$	248D
C-2	to 27	$C_2A = C - 1.66B - 0.18D$	$C_2S = 0.40B + 0.22D$	1462 —
	1.88	Liquid $= 1.87B + 1.47D$	$C_2A = C + 0.26D - 0.70B$	L
			$C_2A_3 = 0.51B - 0.19D$	
			$C_4AF = D$	
	More	$C_2S = A + 0.72B - 0.17D$	$C_2S = A + 0.72B - 0.17D$	290D
	than 28	$C_2A = C + 0.14D - 1.83B$	$C_2S = 0.46B + 0.13D$	1470 —
	1.88	Liquid $= 2.11B + 1.03D$	$C_2A = C + 0.15D - 0.64B$	L
			$C_2A_3 = 0.46B - 0.11D$	
			$C_4AF = D$	
Liquid Leaving C_2S-C_4AF Surface to Follow T_1X				
	B/C			
	0.0	$C_2S = A + 2.69B - 1.27C$		18C
C-1	to 29	$C_4AF = D + 6.23B - 4.23C$		1347 —
	0.43	Liquid $= 6.50C - 7.92B$		L
Liquid Leaving T_1D or T_1X to Follow CaO-C_2S Surface				
	C/D			
C-1	0.24	$CaO = 0.22C - 0.33B - 0.05D$	$CaO = 0.22C - 0.33B - 0.05D$	25D
C-3	to 30	$C_2S = A + 1.33B - 0.34C - 0.22D$	$C_2S = A + 1.33B + 0.21D - 0.90C$	1328 +
	0.64	Liquid $= 1.12C + 1.27D$	$C_2S = 0.68C - 0.16D$	L
			$C_2A = C$	
			$C_4AF = D$	
	0.64	$CaO = 0.19C - 0.33B - 0.04D$	$CaO = 0.20C - 0.33B - 0.04D$	149D
	to 31	$C_2S = A + 1.33B - 0.32C - 0.23D$	$C_2S = A + 1.33B + 0.15D - 0.80C$	1416 —
	0.80	Liquid $= 1.13C + 1.27D$	$C_2S = 0.60C - 0.11D$	L
A-2			$C_2A = C$	
			$C_4AF = D$	
C-2		$CaO = 0.19C - 0.33B - 0.04D$	$CaO = 0.19C - 0.33B - 0.04D$	248D
C-4	0.80	$C_2S = A + 1.33B - 0.32C - 0.23D$	$C_2S = A + 1.33B - 0.32C - 0.23D$	1462 —
	to 32	Liquid $= 1.13C + 1.27D$	$C_2S = 0.24C + 0.17D$	L
	3.33		$C_2A = 0.58C + 0.34D$	
			$C_2A_3 = 0.31C - 0.24D$	
			$C_4AF = D$	
	More	$CaO = 0.18C + 0.02D - 0.33B$	$CaO = 0.18C + 0.02D - 0.33B$	290D
	than 33	$C_2S = A + 1.33B - 0.33C - 0.21D$	$C_2S = A + 1.33B - 0.33C - 0.21D$	1470 —
	3.33	Liquid $= 1.15C + 1.19D$	$C_2S = 0.25C + 0.16D$	L
			$C_2A = 0.65C + 0.10D$	
			$C_2A_3 = 0.25C - 0.07D$	
			$C_4AF = D$	

* The percentage of C_2S should be calculated first. If a negative value is obtained, the liquid has passed from the C_2S-C_2S surface at a temperature below 1400°.

** The percentage of C_2S at equilibrium should be calculated first. If a negative value is obtained, the liquid has passed from the C_2S-C_2S surface at a temperature below 1450°.

cluding with the liquid only that part of the magnesia which is capable of dissolving in the liquid. For example, it has been found by Brownmiller[7] that the liquid T_2 is capable of dissolving about 6.0 percent by weight of magnesia. In that case, if the magnesia content of a clinker is greater than 6.0 percent of the calculated liquid content, only that amount of magnesia should be added, the remainder being represented as free MgO.

It should be observed that correction of the phase composition by adding magnesia and the alkalies to the calculated liquid composition is equivalent to assuming that these oxides will dissolve without altering the relative proportions of CaO, Al_2O_3, SiO_2, and Fe_2O_3 in the liquid. This is improbable, since the addition of these oxides changes to one of more than four components. However, it is probably a better procedure than ignoring the presence of the additional oxides.

[7] Reported by W. Lerch and W. C. Taylor. Some Effects of Heat Treatment of Portland Cement Clinker. Concrete, M. S. v. 45, pp. 199, 217 (1937). Paper No. 33, Portland Cement Association Fellowship, U. S. Bureau of Standards.

Magnetic Separation

(Continued from page 41)

etc. It is usually easier and cheaper in the long run to keep iron out of a product than remove it once it gets in.

Below are summarized some of the most favorable conditions for efficient magnetic separation:

(1) Iron present in a strongly or moderately strong magnetic condition, such as metallic iron, magnetite, franklinite, ilmenite, pyrrhotite, biotite, siderite or hematite.

(2) Iron bearing minerals present in distinct grains of say 80-mesh or coarser; or, as in a sand or sandstone, as heavily iron stained or encrusted grains of sand.

(3) When the crude rock is crushed to a size favorable for magnetic separation (say 20 to 50-mesh) the iron bearing grains break cleanly away from the pure mineral, with but few attached or included middlings.

(4) When crushed the iron bearing mineral is not brittle and does not readily disintegrate to a fine powder.

(5) The crude ore, when crushed, readily breaks down to a finely granular form without making a large proportion of fine dust.

(6) An essential of good magnetic separation is a free-flowing feed. Some ores are "sticky" and clot as coarse as 50-mesh, if the fines are left in, and others are fairly free-flowing as fine as 200 mesh. Moisture and the presence of large amounts of impalpable dust promote sticking, balling-up, and clotting. Hence, a dry feed, one which is not hygroscopic, and one low in impalpable fines is to be desired.

(7) Feed runs uniform in fineness and composition. Non-uniform feed makes frequent separator adjustment necessary, or low capacity and low efficiency result if machines are set for poorest feed.

In addition to the reverse of the above conditions, unfavorable factors are:

(1) High percentage of very feebly magnetic impurities, especially if they tend to form attached or included middlings.

In many plants the full value of magnetic separation is not obtained. This is especially true where separators are introduced into a pre-existing plant. Magnetic separation is often tacked on to a flow sheet without much study and without making changes in the process to permit the most efficient operation of the separators. It is probable that in some existing plants magnetic separator capacity could be increased, waste decreased and products improved if feed were better prepared and a proper "magnetic flow sheet" designed.

If magnetic separation is to be most effective, the handling, crushing, and treatment of the ore from the deposits to the separators should be done in such a way as to make a minimum of fine dust, keep out added iron in any form, eliminate segregation and give to the separators a dry, uniform, properly sized feed, low in fines. Magnetic head pulleys on main conveyors and magnetic drums before the separators help to eliminate iron and enable the separators to do better work. If the retreatment of middlings is feasible technically and justified economically, a closed-circuit magnetic flow sheet may be devised so that only high iron tailings are rejected and over-all recoveries much increased. This requires a lot of detailed, systematic study, microscopic examinations and screen tests of middlings, laboratory magnetic separator tests, etc., but if separator losses can be halved the work should be justified.

[4] Taggart, A.T., Handbook of Ore Dressing, New York, 1927, p. 913, also 905-906.

[5] Ramsey, D. M., and Brier, R. K., High Intensity Magnetic Separation of Industrial Minerals, Trans. Can. Inst. Min. & Met., 1937, pp. 730-734.

Acknowledgement

The writer wishes to thank the officials of the Dings Magnetic Separator Co. and The Exolon Co. for their assistance in criticising this article and for furnishing illustrative material.

Wood Burning Lime Kiln Improvements Abroad

By VICTOR J. AZBE

Consulting Engineer, St. Louis, Mo.

Articles on wood fired kilns published recently in ROCK PRODUCTS on different occasions have stirred up the interest of lime men in the remotest corners of the world. Letters are received that are in transit for weeks. Some come from as far as 12,000 miles, or half way around the earth.

Interest also has been shown in the United States, extending from the northern-most lime plants at Roche Harbor, Wash., located on an island in Puget Sound, to plants in Wisconsin, Alabama, Tennessee, Washington, Florida and the New England states. Several Canadian plants in Quebec, Ontario and Alberta, are preparing to change.

In far-away Java, Netherlands, East Indies, half around the world, mixed feed kilns are being changed to this entirely new system of wood gasification and application of gas through center burners.

Of the various letters, one from the Philippines is quoted below:

"For many years, I have been a faithful subscriber of your magazine, and have considered it ever since as my guide in running a pretty fair lime business. Its instructive articles have enlightened me on many phases of lime manufacture, and ever since I received my first copy, I have always looked at it as a helper and a friend. Now that I find myself undecided and uncertain on a certain point, important to lime manufacture, I without hesitation write you, knowing full well that you will not deny me your helping hand.

We have two continuous wood fired lime kilns, and before we had read the articles by Mr. Azbe on "Wood as a Lime Kiln Fuel," we were content with producing with one cord of 6 x 6 x 3' of firewood, one ton of medium burned lime. Per day our two kilns produce approximately 8 tons! After having condensed the current articles of Mr. Azbe, we felt guilty for having allowed this thing to continue without having consulted those on the know. We have therefore decided to make a complete change and consult you in the matter."

To obtain only one ton of lime from a cord, even a cord of very resinous wood, and a capacity of only eight tons from two kilns indicates that some sort of improvement is quite in order.

In Klaten, Java, Netherlands, East Indies, they have some Belgian mixed feed kilns using coke for fuel, from which they obtain very good results. But coke costs about $25.00 a ton, while bagasse from the sugar mills can be obtained for $1.50 a ton and a very good grade of wood for $4.00 a ton. Although bagasse is a low grade fuel, it is no lower than that of the Chicago lime plant that used, and as far as we know may still be using, saw dust and even shavings that have served their purpose as bedding for horses in stables.

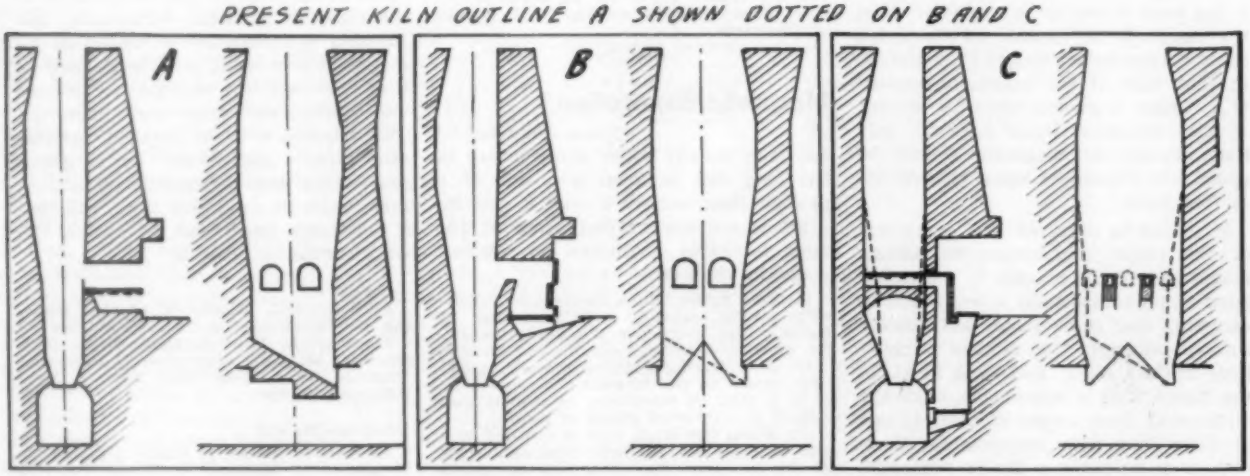
High moisture fuels give very low kiln temperatures, but if the arrangement is such that the cooler of the kiln is utilized and hot air is obtained in this way for combustion, this handicap is in great measure corrected. Bagasse may prove a quite practical and even desirable fuel, as in its shredded form it would be simple to handle. With this cheap fuel the lime could be made at a fraction of the fuel cost using other fuels, and the lime itself would be in all ways superior to the mixed feed kiln burned lime.

Correspondence with this plant is either air mail by China Clipper at a cost of 70c a half ounce or air mail between Java and Amsterdam and then by ship to New York. There is little choice. Our last letter and its reply made the trip completely around the world for which, together with the delays, almost two months were necessary. Correspondence with the South American plants is also by air mail at 40c a half ounce, which is much cheaper, but even then all letters are written on tissue paper. The Pan-American service is very good, and ordinarily a reply can be expected from the Argentine in about a little less than three weeks time.

Foreign plants ordinarily present queer problems to solve. When it is a matter of building new plants, it is fairly simple, but when it comes to reconstruction of the old so many difficulties are encountered that at times one wonders whether a solution is possible. One such case was a South Ameri-

LIME FORUM

Mr. Azbe is a contributing and consulting Editor of ROCK PRODUCTS. He will be glad to receive inquiries from his readers, and will answer these direct or through the columns of this Forum.



Suggested changes in kiln design of Canteras "El Sauce" kilns. Fig. "A" original design. Fig. "B" furnace rearranged and deepened to make it act as a semi-gas producer. Fig. "C" is the final design

can plant whose kilns are arranged as shown in Fig. A in the illustration. The kilns are located right up against a hill side, and were fired from one side only. The lime was drawn from one end. Kilns were right against each other with no chance for getting in between. Evidently, the furnace arrangement was wrong and so was the drawing system; incorrect even beyond the degree one encounters in any ordinary wood burning plant. Then, in addition, there were operating imperfections. For example, lime was taken from the kiln only twice a day.

Fig. "B" shows a half way step for improvement. The furnace was rearranged and deepened to make it act as a semi-gas producer. The cooler also was changed, the intention being to allow some of the air to come up through the cooler to burn the gas that was coming in from the improvised producer. Although there is little difference between Figs. "A" and "B" as to arrangement, there is a great difference in possibilities, but although results would be better the design would still be far from right. Further improvements were, therefore, incorporated in the design when the arrangement shown at "C" was arrived at.

In this case the shaft was made much larger. Alongside the kiln, a deep gas producer was laid out which was to be ashed in the drawing pit; the air was also to come up from the draw pit. From the producer, the gas entered two center burners, the first time that two center burners were planned. For trimming the kiln, three poke holes were provided.

The entire arrangement, Fig. "C", now appears as simple, but it was not simple to arrive at the solution which is about as good as one could possibly develop, considering that the kiln is accessible only from one side.

Efficiency under which this kiln operated was only 19.8% on an available heat basis, compared to the Moosehorn kiln, which is 74%. In capacity it also fell far short, only 289,000 B.t.u. being absorbed in relation to one square foot of shaft area, while Moosehorn capacity is equivalent to an absorption of 825,000 B.t.u., even though the Moosehorn kilns are also of the natural draft type. The South American plant's kilns, therefore, had an efficiency and capacity only about one-third of what they should have been.

In another South American plant, a series of new kilns were built to supplement their present kilns, which are of the Mead type. For St. Marc, in Quebec, two somewhat similar kilns are contemplated, but arranged for induced draft. When these kilns go into service they will be the first wood fired kilns operating on induced draft.

Lime burning is making rapid progress, and at the present time more new kilns are being built on the North American Continent than ever before, and from this article one should gather that the trend is world-wide.

Coal Requirements in Burning Lime

By N. W. TAYLOR
Morgantown, W. Va.

VARIATIONS in the coal required to calcine one ton of limestone are dependent upon several factors. The first essential is a tight kiln shell, preferably steel, to seal out all cold air leaks. The next factor is draught. Kilns operated under forced draught usually report more efficient coal consumption. But forced draught has the attendant dangers of overburned lime. An induced draught has less danger of overburning where artificial draught is required.

Costs relative to oil fired or natural gas fired kilns are not available covering a sufficient period of time or a wide enough range of conditions to give any authentic comparative figures.

Since the lime industry depends so largely upon coal and wood as fuel, a survey of results obtained with these old "stand-by" fuels is worth analysis.

The results obtained depend to some extent upon the chemical and physical character of the limestone. A high silica or alumina stone requires more coal. But since a high chemical purity is required, these so-called "bastard" limes are seldom burned. A high alumina stone has a tendency toward producing a hydraulic cement when it slakes so this class stone is seldom utilized.

Coal requirements per ton of stone are one to three (1:3) in the less efficient kilns. One ton of coal will calcine three tons of stone. Highly efficient plants with mechanically controlled draught sometimes report one ton of coal will calcine five tons of stone.

The following figures were taken from a very average operation. Stone of average 90 percent calcium carbonate which weighed 110 lb. per cu. ft., was used.

2,000 lb. of coal calcined 6,000 lb. of stone
6,000 lb. of stone produced 3,540 lb. of quicklime
3,540 lb. of quicklime produced 4,660 lb. of comparatively dry hydrate

This ratio was:

1 ton of coal to 1.77 tons of quicklime.
1 ton of coal to 2.33 tons of hydrate.

A sample of the hydrate when exposed to excess moisture was found to absorb 12 percent of its own weight in additional water. This hydrate was considered to be completely slaked before being exposed to the excess moisture, and this opinion was verified by the fact that volume did not increase after the excess moisture was encountered.

Affinity for excess moisture indicated the lime was over-burned.

To a small degree, the chemical analysis of the coal affects the efficiency of burning. The coal used in the above case carried a fixed carbon content of 55.40 percent and a content of 36.10 percent volatile matter.

The complete analysis of the coal used in the above case follows:

Moisture	1.13%
Volatile	36.10%
Fixed Carbon	55.40%
Phosphorus	0.015%
Ash	7.38%
Sulphur	2.61%

The heat value of the above coal sample was set at 13,967 B.t.u. per ton. Another sample of the coal showed 14,045 B.t.u. Naturally, there would be some variation in efficiency, corresponding to the variation in the B.t.u. heat value of the coal.

Hydro-ferrites of Lime

Dr. Eng. Antoni Eiger (Revue des Mat. de Constr. et de Trav. Publ. No. 334, July, 1937. p. 141.) describes a new ferrite of calcium: $3CaO.Fe_2O_3.6H_2O$. This compound was obtained by the action of colloidal hydrate of iron oxide on a supersaturated solution of lime in water. Dr. Eiger mentions another hydrate of the composition $4CaO.Fe_2O_3.7H_2O$, discovered by Hoffman (Dissertation. Berlin. 1934.) Thus there exists hydro-ferrites of tri and tetra-calcium, representing an analog to the already known hydro-aluminates of lime.

According to Wm. Lerch and R. H. Bogue:

$$4CaO.Al_2O_3.Fe_2O_3 + xH_2O = 3CaO.Al_2O_3.6H_2O + 3CaO.Fe_2O_3.yH_2O.$$

In Dr. A. Eiger's opinion the hydrolysis of Brownmillerit may proceed, as shown in the equation:

$$4CaO.Al_2O_3.Fe_2O_3 + xH_2O = 3CaO.Al_2O_3.6H_2O + 2Fe(OH)_3 + Ca(OH)_2 + yH_2O.$$

Inasmuch as the solution is supersaturated in respect to $Ca(OH)_2$, the formation of hydro-ferrite of lime ($nCaO.Fe_2O_3.yH_2O$) is very probable. A further study of calcium-hydro-ferrites may give us a better understanding of the hydrolysis of Brownmillerit, the knowledge of which is still obscure.

AUSTIN-WHITE LIME CO., Austin, Texas, was an innocent victim in a recent train wreck of the Missouri Pacific's Sunshine Special. The train was derailed and smashed into the kilns of the plant at McNeil, Texas.

HINTS AND HELPS for Superintendents

Increasing Life Of Trucks

ONE OF THE EARLIEST quarry companies on the West Coast to install motor trucks for haulage between quarry face and crushing plant was the Basalt Rock Co., Napa, Calif. Mack trucks with special steel bodies have been in constant use there since 1926—12 years. The quarry superintendent, Louis Cassayre, is an excellent mechanic and the trucks have been kept in fine mechanical condition in spite of their battered appearance. (Fig. 1.)

The weakest link in the mechanism of the trucks appeared to be the shaft and sprocket mountings for the chain drives. These Mr. Cassayre has reinforced by brackets, as shown in Figs. 2 and 3. These brackets, or really trusses, are fastened to the chassis by bolts and can be removed to get at the sprocket axle or shaft. The actual truss design apparently is not important, as both the types shown serve the purpose satisfactorily.

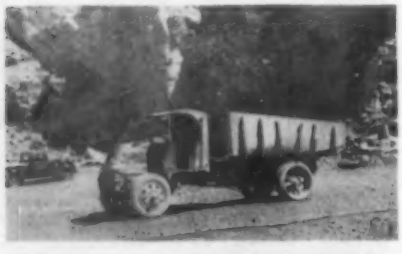
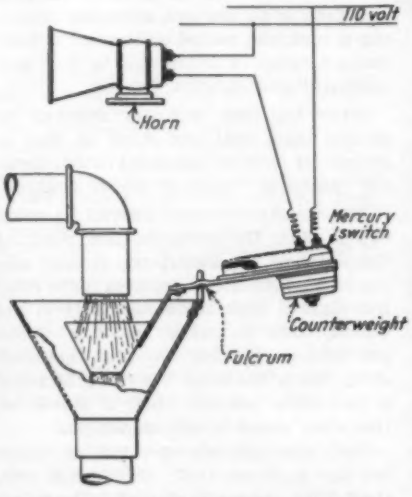


Fig. 1: Careful maintenance keeps old trucks in good mechanical condition. Figs. 2 and 3: Reinforced brackets for shaft and sprocket mountings for chain drives

Water Alarm System For Air Compressors

SANTA CRUZ PORTLAND CEMENT CO., Davenport, Calif., has used a unique device as a warning that the water supply to the water jackets of compressors is running low.



Sketch showing how electric horn signal operates when water supply runs low

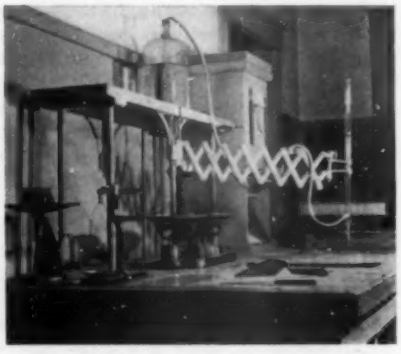
As shown in the sketch, the alarm consists essentially of a steel lever with a small funnel on one end and a mercury switch and counterweight on the other end; a steel fulcrum riveted to the discharge funnel; and a horn. As pointed out in *Engineering and Mining Journal*, the operation of the device is simple. The water from the water jacket flows into the small funnel, which is so constructed that, with the normal flow of water the funnel will be held in its lowest position, thus keeping the mercury switch open. If the water supply should fall below normal or stop entirely, the counterweight will immediately raise the funnel, close the mercury switch, and the horn will sound the alarm.

Extension Bracket for Laboratory Burette

By C. H. PICKENS

Chemist, Pennsylvania-Dixie Cement Corp. Kingsport, Tenn.

IN THE ACCOMPANYING ILLUSTRATION is shown a handy extension bracket for holding a burette on a physical laboratory table. This burette can be swung to any position on the table, and when not in use can be pushed back out of the way of the operator.



Bracket to hold burette

Having sufficiently rapid delivery, the burette can be used in making briquettes. It also has a hose for re-filling at the bottom.

Calculating Specific Gravity of Blended Aggregates

By STANLEY M. HANDS

"WHAT IS THE CORRECT WAY to calculate the specific gravity of a mixture composed of a blended sand, filler or other aggregates, particularly as to the weight per cubic foot or volume created by such blends or mixtures?" This question has been asked by a number of producers and engineers, and below will be given a comparatively simple way of obtaining the answer.

The correct average specific gravity is not the sum of the products' percentages of the different parts multiplied by their respective specific gravities. If all the specific gravities are nearly the same, the difference in two methods makes very little variation in the answers, but only the following method is correct. It can be found in several text books, one of which, *Richardson's Asphaltic Mixtures*, is authority for the method described.

Let p1 represent the percentage of materials with specific gravity g1 and let p2 be that for material with specific gravity g2, etc. Four materials will be enough to show how the calculation is made. As an example, a concrete mixture may be taken which will be made up of water, cement, fine and coarse aggregates, each having a different spe-

cific gravity. If the combined weight is W, what is the average specific gravity G?

The average specific gravity G is found from a fundamental relation that the sum of the absolute volume of the parts is the volume of the whole. That is,

$v1 + v2 + v3 + v4 = V$ which may be expressed as,

$$\frac{\text{weight } W}{\text{gravity } G} \text{ or,}$$

$$\frac{p1W}{g1} + \frac{p2W}{g2} + \frac{p3W}{g3} + \frac{p4W}{g4} = \frac{W}{G} = V.$$

Strike out the W from both sides of the equation and,

$$\frac{p1}{g1} + \frac{p2}{g2} + \frac{p3}{g3} + \frac{p4}{g4} = \frac{1}{G} \text{ or,}$$

The average specific gravity G equals

$$\frac{1}{\frac{p1}{g1} + \frac{p2}{g2} + \frac{p3}{g3} + \frac{p4}{g4}}$$

Example: A batch of concrete weighs 4107.17 lb. wet. It contains 6.47% water; 11.44% cement (gr. 3.12); 32.84% sand (gr. 2.60), and 49.25% rock or coarse aggregates (gr. 2.70).

G therefore equals

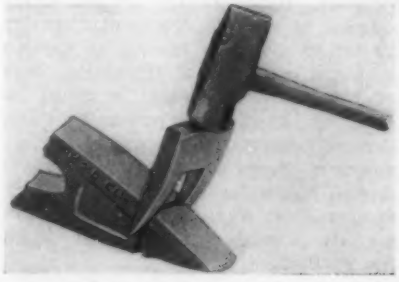
$$\frac{1}{\frac{.0647}{1.00} + \frac{.1144}{3.12} + \frac{.3284}{2.60} + \frac{.4925}{2.70}} = 2.434$$

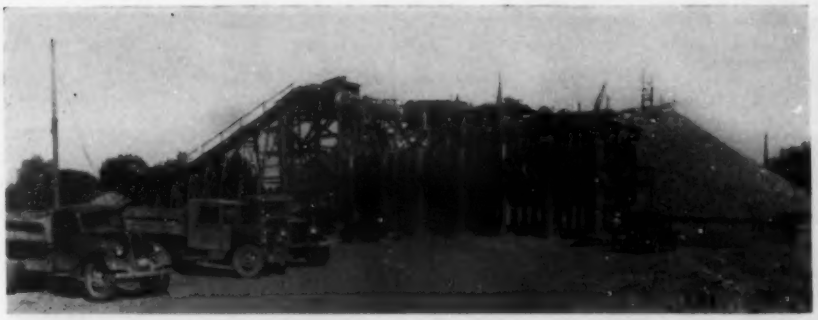
$$V = \frac{4107.17}{62.5 \times 2.434} = \frac{4107.17 \text{ lb. per batch}}{152.125 \text{ lb. per c.f.}} = 27 \text{ cu.ft.}$$

Saving Money on Small Items

SAND AND GRAVEL PLANTS in the Northwest have had rather hard picking in the last few years, and as usual in such cases operators' ingenuity to reduce costs has been exercised fully. Probably a typical example is the Yakima Sand & Gravel Co., Yakima, Wash., visited by the editor in August.

The plant itself is of a type apparently common in this section. It consists of a row of wood truck-loading bins, over which is built a simple screening plant—a rotary or trunnion screen, and a vibrating screen for the small sizes of gravel.





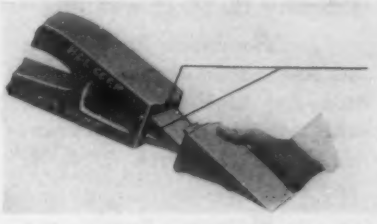
Combination screening plant and wooden truck loading bins of Yakima Sand & Gravel Co.

The screens are fed by an inclined belt conveyor from a hopper at ground level. The material is brought to the hopper by a Sauerman 2½-cu. yd. Cresent scraper bucket, pulled by a two-speed Washington Iron Works electric hoist. The digging is coarse gravel with insufficient sand, so that a good part of the gravel is wasted.

W. H. Ross

Bucket Teeth

While examining the Cresent bucket, W. H. Ross, secretary and treasurer of the company, said: "Let me call your attention to the bucket teeth; replacements now cost us less than one-half of the former cost; and in digging this hard gravel in these hard times that's a real item."



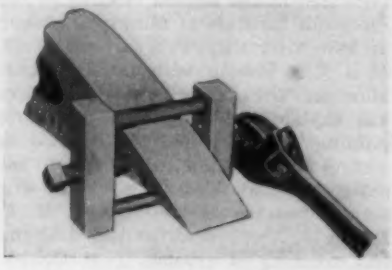
Method of replacing a worn out toothpoint. Left: Strip off worn point with driving wedge. Above: After removing point, thoroughly cleaning slot and side impressions. Right: Crimp new point on by means of screw jack and force of sledge

The bucket teeth are something new, although it was found later that nearly all the producers in the Northwest knew about them and are using them. Instead of being a whole tooth these are made in two parts, an adapter, which is permanently fastened to the bucket lip, and a tooth point.

The accompanying illustrations show how the tooth point is applied and removed. It is merely crimped on by means of the screw jack, and at first its inventors were skeptical of its ability to stay on under this kind of hard service. However, it has. The same general type is also used for power shovel dipper teeth, where they stand up, apparently, even in handling stone in quarries.

Bucket with replaceable teeth points intact

The inventors and manufacturers of this device are a couple of engineers, C. E. Hosmer and E. L. Saunder, who have built a plant in Huntington Park, Los Angeles, Calif., and are doing quite a flourishing business locally. They call their concern, H. & L. Company.



NATIONAL ASSOCIATION ACTIVITIES

Sand and Gravel Safety Trophy Awards

IN THE ACCOMPANYING ILLUSTRATION is shown one of the handsome trophies awarded by the Bureau of Mines in coöperation with the National Sand and

Trophy awarded to sand and gravel plants having the best safety records in 1937

Gravel Association for the best safety records among sand and gravel plants. These trophies have been provided by ROCK PRODUCTS for a number of years, and are presented at the annual convention by the National Sand and Gravel Association.

A. I. M. E. Meeting

SOME PAPERS and addresses of unusual interest to rock products men will be presented at the annual meeting of the American Institute of Mining Engineers in New York City, February 13 to 16. At a joint session with the Industrial Minerals Division, Harlowe Hardinge will explain the relation of sound to grinding efficiency and the method to control mills by their own sound, in his paper on the "electric ear". At the regular sessions of the division, R. A. Kinzie, Jr., will describe the grinding and calcining of gypsum. J. E. Conley, who has made studies on the intricacies of calcining limestone, dolomite, and magnesite to prepare them for various uses, will present a paper containing some new conclusions on the mechanism of calcination. H. C. Krause will discuss production of limestone for chemical use. E. H. Nichols will have a paper on the roofing granule industry. H. Foster Bain had been invited to talk on industrial minerals in Manchuria.

Under the topic "Mining Methods" at the general session on Monday morning, J. Barab, Hercules Powder Co., will discuss "Modern Trends in Quarry Blasting," and H. D. Jumper, Consolidated Rock Products Co., Los Angeles, Calif., will present a paper on "Mining and Preparation of Sand and Gravel in Southern California."

Three papers of particular interest to rock products men will be presented Tuesday afternoon: "Removing Dynamite from Unexploded Well Drill Holes Drilled in 1912", by V. M. Frey, consulting engineer; "The Silicosis Problem", by E. H. Nichols, The Funkhouser Co.; and "A Summary of Information on Silicosis", by R. R. Sayers, U. S. Public Health Service.

1939 Conventions

American Concrete Institute, annual convention, at the Roosevelt Hotel, New York, March 1, 2, and 3.

American Institute of Mining and Metallurgical Engineers, annual convention, at the Roosevelt Hotel, New York, February 13, 14, 15, and 16.

American Road Builders Association, annual convention and highway exhibit, at the Civic Auditorium, San Francisco, Calif., March 7, 8, 9, and 10.

National Sand-Lime Brick Association, annual convention, Hotel Statler, St. Louis, Mo., February 7 and 8.

Lime

NATIONAL LIME ASSOCIATION, Washington, D. C., has announced through H. A. Huschke, manager of the agricultural department, that a set of new soil liming charts had been completed and were being distributed. If sufficient interest is shown in these charts, three of them will be reproduced on a single cardboard about 15- x 36-in. for display in dealers' warehouses.

Slag

AT THE ANNUAL MEETING of the National Slag Association, held at the Raleigh Hotel, Washington, D. C., on January 10, the directors elected the following officers for the year 1939: President, George A. Mattison, Jr., Woodstock Slag Corp., Birmingham, Ala.; vice-president, L. E. McDermut, Illinois Slag & Ballast Co., Chicago, Ill.; secretary-treasurer, H. J. Love, Washington, D. C.

Concrete Institute

MANY INTERESTING PAPERS are on the program of American Concrete Institute annual convention to be held in the Hotel Roosevelt, New York, March 1, 2, and 3. These papers include the following: Maintenance and Repair of Bridges, C. B. McCullough, assistant state engineer, Oregon State Highway Department, Salem, Ore.; Structural Design of Pavement Slabs, by E. F. Kelley, chief, division of tests, U. S. Bureau of Public Roads, Washington, D. C.; Curing of Concrete Pavement, by F. H. Jackson, senior engineer of tests, U. S. Bureau of Public Roads, Washington, D. C.; Concrete Pavement Durability, three papers giving experience in three states, by Elmer Lawton, deputy commissioner of highways, New York, Albany, N. Y.; F. W. Marshall, chief engineer, Pennsylvania Department of Highways, Harrisburg; E. C. Welden, deputy state highway commissioner, Hartford, Conn.; Ordinary Concrete, by Miles N. Clair, vice-president, Thompson, Lichtner Co.; A System of Control for Scattered Small Jobs, by R. B. Young and Wilfrid Schnarr, Hydro-Electric Power Commission of Ontario, Toronto; Concrete Design vs. Concrete Placing, by George L. Lucas, engineer of inspection, Port of New York Authority; A Study of Bleeding, by T. C. Powers, Portland Cement Association; Concrete Construction Features of Naval Experimental Model Basin, by Com. Hugo C. Fischer, U. S. Navy; Beams with Intermediate Expansion Hinges in Rigid Frame Bridges.

Concrete Conventions In Chicago

Merchandising methods and technical progress in the concrete products industry are featured in the program prepared for the joint convention of the N. C. M. A., N. C. C. P. A., Cast Stone Institute and other concrete groups meeting at the Sherman hotel, Chicago, February 7, 8 and 9 The Concrete Industries Exposition, according to advance information, is to surpass even that of last year and will offer really new developments in machinery and equipment that have never been displayed before.

Popularizing the Concrete House

Joint meetings will provide much to interest all the groups, and special sessions will afford an opportunity for round table discussion of "live" subject matter. Meetings of the National Concrete Masonry Association feature discussions by men in the industry who have "gone to town" in developing and promoting new ideas.

Charles Akers, well-known concrete block manufacturer of Nashville, Tenn., will describe an advertising campaign to popularize concrete houses in Tennessee. In the Milwaukee area, experiences in establishing concrete houses will be discussed by B. D. Kealts, housing engineer of the Portland Cement Association.

Ed Olsen, of the Badger Concrete Products Co., Oshkosh, Wis., will give the facts about a merchandising campaign developed around a demonstration house and the results. Another talk will be on how volume sales of concrete masonry units follow the acceptance of concrete houses by the public and a description of the work done by the Eastern Concrete Products Association in establishing such a market.

Important Tests of Masonry Units

One complete session will be turned over to interpretations of recent important tests of concrete masonry units. E. W. Dienhart, assistant secretary of N. C. M. A., will describe some new types of concrete masonry walls which have been tested at the U. S. Bureau of Standards, and how they have pointed out new markets. Hugh Robinson, representing the Chicago Underwriters' Laboratories, will discuss the fire tests on concrete masonry units conducted in 1938 and point out how enlarged sales opportunities have been opened up by the new fire retardant classifications.

One of the joint sessions of the four associations will include a symposium on low cost concrete floors, principally joist and floor-filler tile systems developed by concrete products manufacturers. F. J. Straub, New Kensington, Penn., will give his observations of 20 years' progress in the concrete masonry industry; A. P. Nelson, Spencer, Iowa, will describe experiences in building a successful business in a small community; and Sam Paturzo, Baltimore, Md., will tell about the use of concrete masonry units used in large volume on large housing projects in Baltimore.

One joint session will be devoted to a discussion of housing and general progress in the concrete industry. Speakers will include F. T. Brown of the Missouri State Chamber of Commerce, Kansas City, Mo.; O. W. Rosenthal, chairman of the Illinois Housing Commission, Chicago, and a personal representative of Nathan Straus, administrator, United States Housing Authority. Time will also be given to detailed descriptions of several new types of plants for the manufacture of concrete masonry units and to group meetings of various products manufacturers.

Cinder Concrete Units

Convention proceedings of the National Cinder Concrete Products Association will consist mainly of round table discussions of technical subjects to supplement the program of speakers on the N. C. M. A. schedule, which apply to both groups.

Other scheduled subjects of interest to all groups include a discussion of the latest developments in equipment for mixing and handling concrete by B. F. Devine of the Mixer Manufacturers Bureau, Milwaukee, Wis.; details of placing concrete by the vacuum process by W. F. Lockhart, New York City; cost analyses of different types of concrete house construction, etc.

The Cast Stone Institute has prepared a lively program on marketing and technical problems. F. R. McMillan, director of research, Portland Cement Association, will discuss the theory and practice of reinforcement in cast stone; A. C. Bennett, of the F. W. Dodge Corp., will talk on building market changes that affect the promotion and sale of cast stone; George Saffert, New Ulm, Minn., will discuss diversification of products with special reference to cast stone facings on concrete masonry units; R. E. Copeland, P.C.A., will describe progress on the application of special aggregate facings to cast-in-place concrete.

The group will make an inspection trip to the Portland Cement Association's field laboratory at Elmhurst and to Baha'i Temple, Wilmette.

Foundrymen's Convention

INDUSTRIAL SAND PRODUCERS will be interested in knowing that the American Foundrymen's Association will hold their 1939 convention in Cincinnati, Ohio, May 15 to 18, inclusive. The program will be patterned after the successful technical meetings which were held in Chicago in 1927 and Toronto in 1935.

Concrete Shrinkage

NORMAL PORTLAND CEMENT ground to a specific surface of 1600 sq. cm. per g. and the same cement ground to 1980 sq. cm. per g. produced less shrinkage in concrete specimens at both 7 da. and 28 da. than low heat cement, high early strength cement, modified portland cement, or three samples of portland-puzzolan cement, in tests reported by G. E. Troxell, University of California, in the November issue of the *Journal of the American Concrete Institute*. The tests were made primarily to develop a short-time method of estimating concrete shrinkage.

Concrete Forts

VACUUM CONCRETE CO., New York, N. Y., recently demonstrated the manufacture of a concrete "pill box", 20 ft. long, 12 ft. wide, and 9 ft. high, at the Bureau of Standards in Washington, D. C., using the patented vacuum process. Military and diplomatic observers from various foreign countries were invited to the demonstration. Karl P. Billner represented the company at this demonstration.

This structure, with walls one foot thick, was made in four hours, but under production methods the time might be reduced to two hours. The vacuum process removes surplus water, reducing the curing period.

Addendum

REFERENCE TO THE MANUFACTURE of stone sand at Hiwassee dam in the first column of the January issue, p. 40, could have been more explicit and should have read, "despite opinions that the product is apt to be too slivery with certain types of rock." The properties of a crushed stone product, including particle shape, are influenced by physical and chemical characteristics of the ledge rock.

NEWS about People

HENRY S. MOSSER was recently elected to the board of directors of the Lehigh Portland Cement Co., Allentown, Penn., to fill the vacancy created by the death of his brother, George K. Mosser. In assuming a position on the board of the cement company, Mr. Mosser follows in the footsteps of his father, James K. Mosser, one of the original directors. The new director is president of Panhandle Lumber Co., and a director of the West Branch Bank and Trust Co., Williamsport, Penn.

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B. E. WELTY, works manager of the United States Gypsum Co., Port Clinton, Ohio, was recently installed as the new president of the Port Clinton Kiwanis Club.

•

COL. FRANCIS C. HARRINGTON has been named acting WPA administrator to fill the place vacated by the appointment of Harry L. Hopkins as Secretary of Commerce. Col. Harrington has been connected with the U. S. Army Engineers for 30 years, and was detailed to WPA in January, 1936, as chief engineer.

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ROBERT E. HARPER, director of public relations of the American Road Builders' Association, has been appointed to membership on the administrative committee of the newly organized Conference on Association Publicity.

•

B. W. DRUCKENMILLER has become general sales manager of Pennsylvania-Dixie Cement Corp., with headquarters in New York City, according to an announcement by Walter S. Wing, vice-president and director of sales. Mr. Druckenmiller started work in the cement industry over 25 years ago.

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CHESTER R. DAVIS, a director of the Chicago Gravel Co., has been elected vice-president and trust officer of the Chicago Title & Trust Co.

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CORYDON H. HALL is the new district manager of Johns-Manville Corp., in Chicago, in charge of the power products department. Mr. Hall is a son of the late Charles C. Hall, Alexandria, Ind., developer of rock wool and generally credited with launching the home insulation industry in America. After graduating from Purdue University in 1920, Mr. Hall joined his father's company, Banner Rock Products Co., Alexandria, Ind., where he had become general manager when the company was purchased by Johns-Manville in 1929.

Transplanted from Vermont Hills

GUY R. VARNUM, whose rugged Yankee physiognomy is shown herewith, came from the granite hills and quarries of Vermont some 20-odd years ago to the sunny shores of southern California. His family was famous in the Vermont granite quarrying industry. Guy graduated in engineering from the University of Vermont, and after some experience in the ancestral granite business,

Guy R. Varnum

went to California and got into the sand and gravel business. Of late years he has been a consulting engineer for rock, sand and gravel producers—and official and unofficial secretary of their local association—which has had an intermittent life, the object of which has usually been to keep its members from all going bankrupt at the same time.

•

DR. H. E. SIMPSON has been appointed to the Industrial Fellowship at Mellon Institute, Pittsburgh, Penn., which has been established by the United States Gypsum Co., Chicago, Ill. This Fellowship will conduct fundamental research on various products manufactured by the donor company, with the objective of developing new processes and technics which will have broad application in the field of building materials.

•

V. V. KELSEY has become president of Dominion Minerals, Inc., Washington, D. C. He was formerly sales manager of the Consolidated Feldspar Corp., Trenton, N. J.

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CHARLES CULLORS of Unionville, Mo., has been operating the quarry near Milan, Mo., pulverizing limestone for agricultural use. Considerable business has been done with farmers this fall.

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R. R. COLE has been appointed production manager of the phosphate division of Monsanto Chemical Co. Mr. Cole will be in charge of operations at Anniston, Ala., Columbia, Tenn., and Camden, N. J. His headquarters will be at Anniston, Ala.

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LOWELL R. BURCH, president of the New York Air Brake Co., New York, N. Y., has acquired financial control of the Glens Falls Portland Cement Co., Glens Falls, N. Y., through the purchase of stock held for George F. Bayle, Sr., by George F. Bayle, Jr., and J. Edward Singleton as a committee, and also shares held by the First National Bank and the Glens Falls National Bank and Trust Co. It is believed that no changes in management will be made until the annual meeting on March 7. About two years ago, Mr. Burch and H. H. Titsworth obtained an option to acquire stock. At the last annual meeting Mr. Titsworth was elected executive vice-president as well as director and Mr. Burch became a director.

Mr. Burch is well known to the old-timers in the cement industry as a former vice-president of the Atlas Portland Cement Co., now part of Universal Atlas Cement Co., Chicago, Ill. The Glens Falls company was incorporated in 1893 with Captain W. W. Maclay as the first president. Land lying between the canal and the river was acquired from the Jointa Lime Co., and Captain Maclay agreed to produce 100 bbl. of cement a day, which is approximately the half-hourly production today. In 1894, it was decided to build two Schofer kilns, and in 1895 the capital was increased and the plant enlarged. On August 5, 1899, the plant was destroyed by fire and was immediately rebuilt. George F. Bayle, Sr., became president of the company January 18, 1905, and the development of the business to its present proportions dates from that time. He continued as president until a few years ago when ill health compelled him to retire. George F. Bayle, Jr., later served as president, and was succeeded a year

ago by J. Edward Singleton. Other officers include Theodore F. Kalbfleisch, Sr., vice-president; H. H. Titsworth, executive vice-president; R. C. Carter, secretary and treasurer.

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JOSEPH D. FACKENTHAL, formerly a member of the firm of Barber, Fackenthal and Giddings, counselors at law, has been elected a director, executive vice-president, and counsel of the New York Trap Rock Corp., New York, N. Y.

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JOHN D. JOHNSON, president of Canada Cement Co., Ltd., Montreal, Que., has been elected a director of The Royal Bank of Canada, Montreal.

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J. A. W. IGLEHART, a partner in the brokerage firm of W. E. Hutton & Co., New York, N. Y., has been elected a director of National Gypsum Co., Buffalo, N. Y.

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JOHN M. SWICKARD is now associated with Al C. Dale, Columbus, Ohio, concrete block manufacturer. In addition to his block business, Mr. Dale handles steel sash and doors. He recently enlarged his office, display room, and warehouse.

•

STUART DUNCAN, chairman of the board of directors, Marquette Cement Manufacturing Co., Chicago, Ill., was recently elected to a third term as president of the Illinois Valley Manufacturers' Club.

•

THEODORE UEHLEIN, foreman at the North Cincinnati Sand and Gravel Co., Cincinnati, Ohio, recently had a very harrowing experience when he was buried up to his chin in a sand hopper. He calmly directed rescue efforts which required two hours. Mr. Uehlein fell to the bottom of the cone-shaped hopper when he lost his footing on a ladder.

•

THOS. C. MILLER, chief chemist, Gager Lime Co., Sherwood, Tenn., has been elected vice-chairman of the southeast section, American Chemical society.

•

ALLEN G. WALTON, who will be remembered as one of the operators of The Hummelstown Brownstone Co., Hummelstown, Penn., manufacturers of sand-lime brick, is now engaged in the gasoline and oil service station business at Hummelstown under the name of the Walton Esso Station. The Hummelstown Brownstone Co. has been out of business for nearly 10 years but Mr. Walton has continued to take an interest in rock products activities. His father organized and owned the sand-lime brick and stone business.

•

F. L. STONE, vice-president of Universal-Atlas Cement Co., Chicago, and

F. L. Stone

Lewis H. Brown, president of Johns-Manville Corp., New York City, have been appointed to the advisory board of the Producers' Council, representing 66 manufacturing representatives. Charles E. Wilson, executive vice-president of the General Electric Co., is head of the advisory board, and Marshall Adams is managing director of the council. The council recently held a meeting in New York City to formulate a program for 1939 to stimulate home building.

Obituaries

ARTHUR HARRIS TAYLOR, president of the White Hill Sand and Gravel Co., Salt Lake City, Utah, died recently at the age of 58. He was also president of the Intermountain Brick Co., and the Taylor Plumbing Co. Mr. Taylor was a prominent member of the Latter Day Saints Church. He was a grandson of the John Taylor, third president of the church.

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RUSSELL CLEMMER, head of the Bachman Terrace Sand Co., Allentown, Penn., was fatally injured when his arm was caught in the belt driving the crusher rolls.

•

WILLIAM ROBBINS SEIGLE, chairman of the board of directors, vice-president and director of research, Johns-Manville Corp., New York, N. Y., died after having undergone an operation at the Mayo Clinic in Rochester, Minn., on December 6th. He was 59 years old. Mr. Seigle, with Johns-Manville for nearly 40 years, literally began "at the bottom", starting as a "jack-of-all-trades" in 1899.

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THOMAS E. SANTEE, manager for the Alpha Portland Cement Co., at Boston, Mass., died on December 26. Mr. Santee had been with Alpha for the past 25 years.

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CARL DYCKERHOFF, internationally-known cement plant owner of Germany and retired chairman of the board of directors, Dyckerhoff Portland Cement Co., A. G., Mainz Amönburg, Germany, died on December 10. Mr. Dyckerhoff was well known to cement officials in this country as he had visited many plants over here and had attended many cement industry meetings. The widespread Dyckerhoff cement interests in Germany were started in 1896, when Carl Dyckerhoff, with his father, formed the partnership of Dyckerhoff & Son. In 1911, the partnership of Dyckerhoff & Son was incorporated, the older generation withdrew from active participation, and Carl, with his brother and cousin, undertook the management of the company. He was active in the company's affairs until 1931, when the company became known as Portland-Zementfabrik Dyckerhoff-Wicking A. G.

•

DR. O. GERLACH, former general manager of the old Iola Portland Cement Co., died in Berlin, Germany, where he was visiting. His home was in Peru, Ill.

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D. FRANK BAIM, office manager and purchasing agent for the Vulcanite Portland Cement Co., Vulcanite, N. J., died recently at the age of 62. He was a past president of the Lehigh Valley Purchasing Agents Association.

•

WILLIAM H. MCGREW, a veteran quarry operator, died recently in Utica, N. Y., at the age of 80. He had been superintendent of quarries in Chicago Heights, Ill., Louisiana, Mississippi, Columbus, Ohio, Havre de Grace, Md., and Leroy, N. Y. His last connection was as manager and plant owner of the L. & M. Stone Co., of Prospect and Utica, N. Y. Mr. McGrew was a well-known and universally-liked member of the New York Crushed Stone Association, and until a few years ago attended meetings regularly. Brownell McGrew, of the Los Angeles, Calif., office of the Allis-Chalmers Manufacturing Co., is a son.

•

SAMUEL J. BREW, superintendent of the Waukesha Sand & Gravel Co., Milwaukee, Wis., died recently.

•

MICHAEL RIESNER, consulting engineer for Worthington Pump and Machinery Corp., Harrison, N. J., died suddenly on December 12. He was an outstanding authority in the field of air and gas compression.

NEW MACHINERY AND EQUIPMENT

Remote Control Unloader of Double-Disc Type

FULLER Co., Catasauqua, Penn., has made further improvements in its remote-control unloader equipment by making a double-disc type to increase capacity. This type of unloader has been used at Grand Coulee Dam to unload freight cars carrying bulk cement. A car of 235 bbl. has been unloaded in one-half hour elapsed time. It is claimed that this type of pump has a capacity of nearly 600 bbl. per hr. when with-

Double-disc type unloader of large capacity designed for freight car and stock-house unloading of cement in bulk

drawing cement from a stock-house bin where there is a steady head of material. This type of pump is now being used by a large eastern cement company to unload cement from a large flat bottom stock-house bin.

Loader With Avalanche Protection Plates

GEORGE HAISS MANUFACTURING CO., INC., New York, N. Y., has made several improvements in its Bank Special Model 80 loader designed to eliminate troubles from avalanches and large cobbles in working high banks.

The model shown in the illustration has the following special equipment: avalanche protection plates, 16-in. by 7 ft. 6 in. creepers, cobble guard plates, overload release head sprocket, steel canopy over operator, and dispatching horn. Avalanche protection plates prevent gravel from falling between the cleanup scraper and the chassis as well as between the creeper elements and the elevator boom, and also keep such gravel out of the driving mechanism for the creeper units.

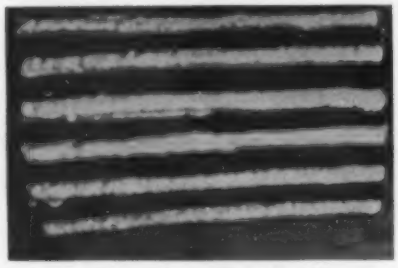
Cobble guard plates which can be seen at the foot of the elevator are cut

Loader having avalanche and cobble protection plates

to spiral shape which force out toward the gravel bank itself any cobbles which may be caught between the inside feeding propeller and the side of an elevator bucket. The overload release sprocket stops the elevator when an unusually large cobble is encountered or the tail shaft is jammed by cobbles.

Hard Facing Wearing Parts By Welding

COAST METALS, INC., Canton, Ohio, has developed several welding rods which are said to be particularly applicable for building up wearing surfaces of crusher rolls and plates, power shovel parts, dredging machinery, and drill bits. Both electric arc and acetylene welding equipment are used in applying these rods.



Crusher plate with wearing surface built up by electric welding

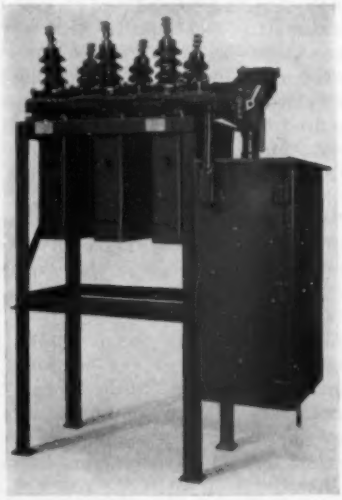
Nos. 1 (acetylene) and 101 (arc) are general purpose rods designed for building up wearing surfaces of cement mill machinery and hammer mill parts. Where high temperatures are encountered, such as valve seat inserts and valves, Nos. 10 (acetylene) and 110 (arc) are recommended. No. 112 (arc) rod has been designed for use where severe impact is encountered, including power shovel parts, dredging machinery, etc.

Electrode for Cast Iron

THE LINCOLN ELECTRIC CO., Cleveland, Ohio, has developed a heavily coated shielded arc electrode designed for depositing a soft machineable alloy on cast iron. It is claimed that the coating on this wire (a non-ferrous alloy) has properties which cause the weld to flow over and bond to the cast iron with a minimum of penetration or heating of the base metal. "Softweld," as it is called, is said to operate best with d.-c. negative polarity, although a.-c. may be used.

Moderate Capacity Outdoor Oil Circuit Breaker

ALLIS-CHALMERS MANUFACTURING CO., Condit Works, Boston, Mass., is now in production on a new moderate capacity outdoor oil circuit breaker of the quick clearing, non-oil-throwing design, known as the type OZ-110. Spe-



Oil circuit breaker of moderate capacity arranged for pole or frame mounting

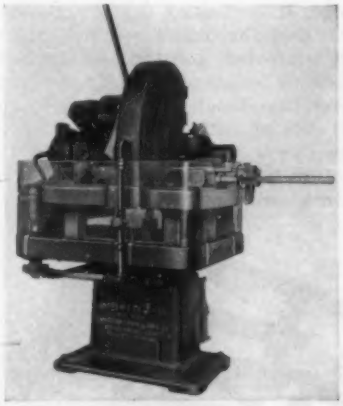
cial interrupting devices, called Ruptors, are used to give quick clearing of short circuits, low arc energy, low pressure, and minimum of oil deterioration. Other features are: rigid cast steel top frames; silver contact surfaces; low-inertia, straight-line-motion type

mechanisms; high speed operator; roomy, weatherproof control cabinet; one-piece, wet process porcelain bushings. The breaker is furnished for 600 amperes at 15 kv., with an interrupting capacity rating of 100,000 kva. It is arranged for pole or frame mounting.

Abrasive Cutting Machine

AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn., has announced through the Andrew C. Campbell division the Campbell No. 213 abrasive cutting machine. This machine is designed to cut tubing up to and including 3½-in., or solids up to and including 2-in.

It is said that with the improved features, the cutting machine eliminates poor cuts which might result from unequal coolant distribution, damage from off-angle wheels, and lost time spent in measurements. The coolant system distributes coolant equally to both sides



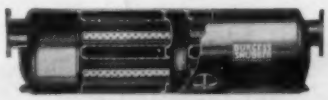
Machine for cutting tubing or solids has a coolant system which distributes coolant equally to both sides of abrasive wheel

of the abrasive wheel. Coolant box side walls are movable and can be pushed out of line without damaging them.

Noise-Quieting Device for Exhaust

BURGESS BATTERY CO., Chicago, Ill., has developed a noise-quieting device which is said to be non-acoustic and can be placed at any point in the intake or exhaust system of an engine or compressor.

The effect of the Burgess Exhaust Snubber, as it is called, is to prevent



Exhaust quieting device

the sudden impact of the slug of vented gas with the atmosphere and also to stop the usual inrush of air into the exhaust pipe, after discharge of the slug. The same type of unit is applicable to intake and output lines of reciprocating and rotary compressors.

Dual Prime Pump

CONSTRUCTION MACHINERY CO., Waterloo, Iowa, has enlarged its 1¼-in. pump to 1½-in. It has the dual-prime method of priming with recirculation cutoff, built-in neoprene suction check valve, trash type impeller, double grease seal, and large water capacity in pump case. The pump, powered by a ¾ to 1 hp.,

Lightweight portable pump suitable for sumps, supplying water to concrete mixers, etc.

four-cycle, air-cooled engine, has the capacity to deliver up to 5000 g.p.m., depending on conditions, and will prime itself automatically on suction lifts up to 25 ft. It is also designed for operation with a ½ hp., 1750 r.p.m., electric motor, driven either by flexible coupling or belt drive.

Shovel With Boom of Built-Up Steel Tubes

THE THEW SHOVEL CO., Lorain, Ohio, has announced the Lorain-79, a 1½-cu. yd. unit convertible to shovel, crane, clamshell, dragline or backdigger service. Mounted on a newly designed chain drive, the machine has a crawler 13 ft. 8 in. long, 10 ft. 6 in. wide which is equipped with 24-in. wide treads, with other treads available in 28-in. and 34-in. widths. The crawler has two travel speeds, 1½ m.p.h. and ¾ m.p.h., available in either direction.

All the propelling and steering mechanism of the crawler is located in a central steel carbody casting or gear box. The gear box casting rests upon a structural steel frame.

The Lorain-79 is supplied with an all-welded shovel boom 23 ft. long from hinge pin to boom peak sheave pin. Each of the two boom side members consists of a built-up steel tube of rectangular cross section, entirely electric welded into a unified structure. This design offers the strength of a girder section coupled with the torsional resistance of a tube. The turntable of the Lorain-79 is built to the center drive design, power being taken from the six

Shovel of 1½-cu. yd. capacity, convertible to crane, clamshell, dragline or backdigger service

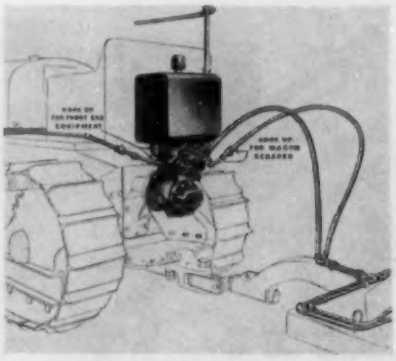
cylinder Diesel motor and is transmitted through a silent chain drive.

The steering clutches slide on splined shafts, and permit steering in either direction. Another feature is the locking and safety ratchet and pawl on the horizontal propelling shaft. The crawler does not have any rollers or idlers along the top to support the top of the crawler tread belt, but instead the top tread belt is supported on a full length T-rail.

Power Control Unit Serves Dual Purpose

CONTINENTAL ROLL & STEEL FOUNDRY CO., East Chicago, Ind., has produced what is known as the Be-Ge hydraulic pump unit. It has been designed primarily for furnishing power to hydraulic jacks that operate Continental wagon scrapers. This pump unit is now made with extra outlets for operating tractor front-end equipment, such as bulldozers, angle blades, loaders, shovels, etc.

The pump on the power control unit



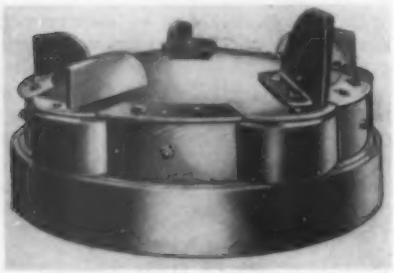
Showing installation details of hydraulic power control unit

is connected to the tractor rear power take-off, and operates at zero pressure when not under load. Valve control has a spring-loaded neutral return which is said to operate easily due to hydraulic balance.

Recent Developments In Concrete Pipe

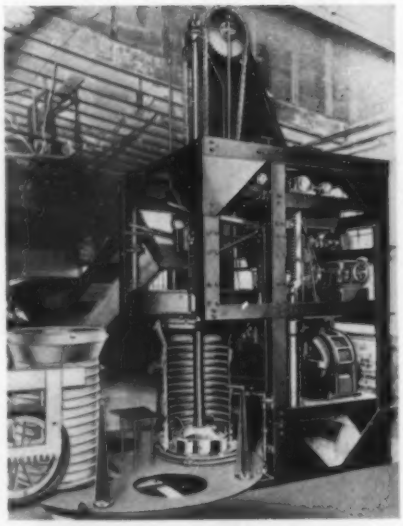
CONCRETE PIPE MACHINERY CO., Sioux City, Iowa, has developed a new model T Dual Packer-Head machine and a portable unit of the same type. Purpose of these improved machines is to increase the ranges of sizes made to include 4- to 36-in. diameters and to cut the transportation factor out of the cost of the pipe. The manufacturer felt that a portable machine would make the process just as applicable to the small town market as it has been in the larger cities because it could be moved in to handle temporary jobs.

To extend the range of sizes, a patented "Roller-Head" was developed to do the same work on 24- to 36-in. diameter pipe as the packer-head has done



New "Roller Head" developed for making the larger diameter pipe

on 4-18-in. diameters. The portable unit, mounted on a special trailer with a mixer, skip loader and a Diesel engine to supply power to both the machine and mixer, is a mobile manufacturing unit that may be operated without removing it from the trailer. This unit is not for sale and will be leased only to manufacturers using the Dual Packer-Head machine in permanent plants, to



Model T plant for installation in permanent plants. Plants operating this machine may become lessees to operate the portable unit anywhere in the United States

open new markets with the selling advantage of using local labor and local materials.

Other products are the "Sealtite Joint" and the "Alignment Perfector." These developments are claimed to eliminate infiltration, with a permanent locked joint, and to give a smooth flow line with greater hydraulic capacity and self cleansing velocities.

Variable-Speed Block Machine Vibratory Attachment

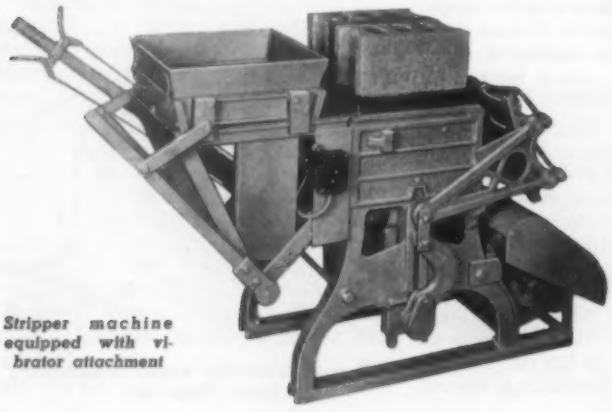
THE MULTIPLEX CONCRETE MACHINERY CO., Elmore, Ohio, announces a new "Multi-Variable Speed Vibration" attachment that is available with newer model machines and for machines already in use. The speed of vibration can be changed according to the type of material being handled—tests conducted by the manufacturer having shown that unlike materials behave differently under vibration.

The illustration shows a Model C Double Stripper equipped with the vibrator attachment which has a 1-hp. motor. When the filling hopper is brought forward it automatically contacts an electric switch which starts vibrating material into the mold box. The standard practice is followed in finishing the top. After the material is vibrated into the mold box, the surplus is carried back into the hopper. Then the vibrator stops, allowing the operator to press the top of the block and strip it out in the same way as with the standard model. This particular machine will make plain or face design blocks under vibration.

Improved Curing Racks

THE CHASE FOUNDRY AND MANUFACTURING CO., Columbus, Ohio, has announced new hinged deck cars and lift truck racks for handling concrete blocks while curing. By hinging the decks, each car or rack becomes one complete unit without any loose parts to spring out of shape. It is claimed that the design is such that the pallets are always properly supported, and that the decks are positively locked when in the raised position. The design permits loading from one side or both so that the operator can always have an empty rack while another is being taken away. The cars have a spring bumper at each end.

Curing rack for concrete products has hinged decks

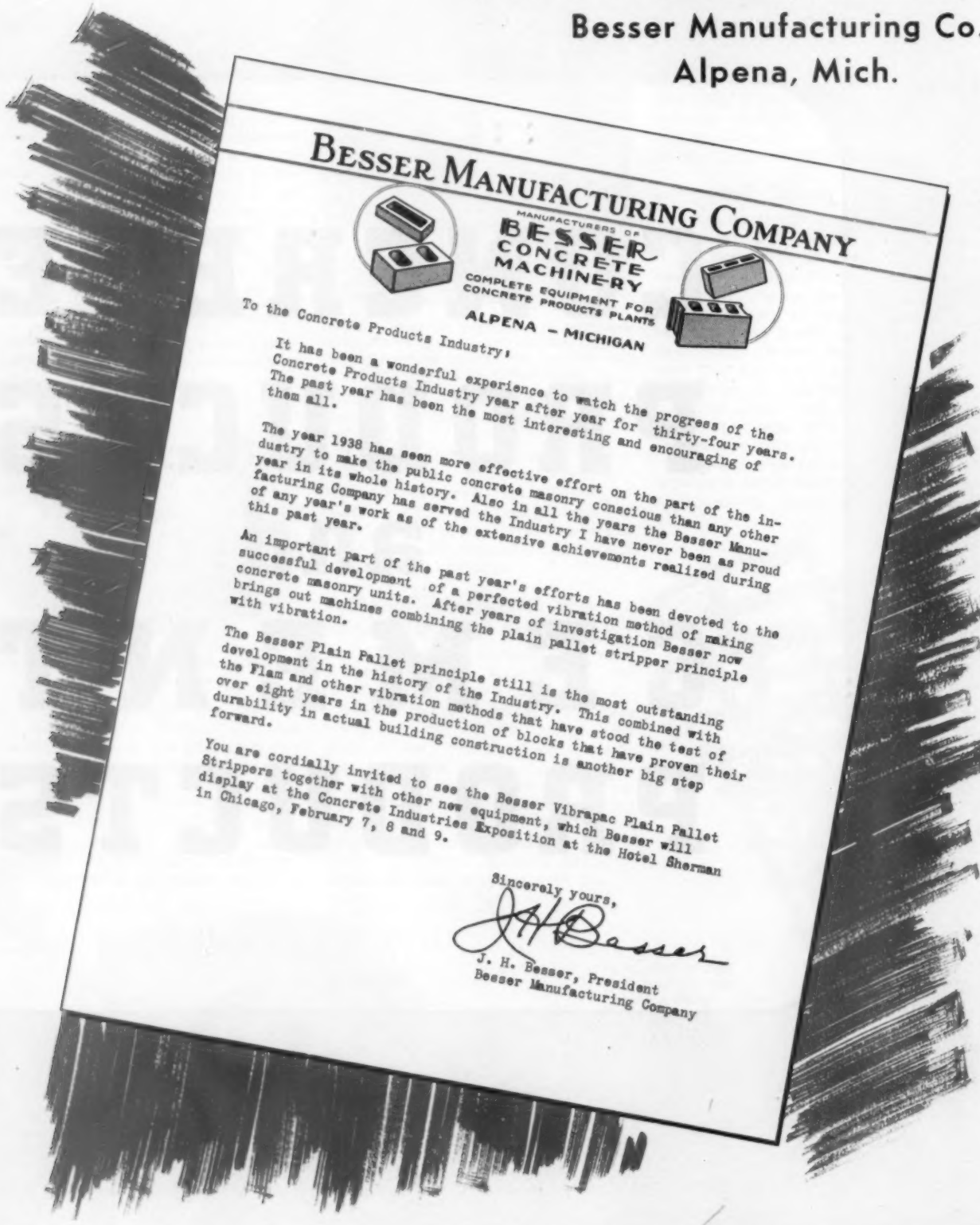


Stripper machine equipped with vibrator attachment

CONCRETE PRODUCTS and CEMENT PRODUCTS

A PERSONAL LETTER TO YOU

from J. H. BESSER, President
Besser Manufacturing Co.
Alpena, Mich.



BESSER MANUFACTURING COMPANY

MANUFACTURERS OF
BESSER
CONCRETE
MACHINERY
COMPLETE EQUIPMENT FOR
CONCRETE PRODUCTS PLANTS

ALPENA – MICHIGAN

To the Concrete Products Industry:

It has been a wonderful experience to watch the progress of the Concrete Products Industry year after year for thirty-four years. The past year has been the most interesting and encouraging of them all.

The year 1938 has seen more effective effort on the part of the industry to make the public concrete masonry conscious than any other year in its whole history. Also in all the years the Besser Manufacturing Company has served the Industry I have never been as proud of any year's work as of the extensive achievements realized during this past year.

An important part of the past year's efforts has been devoted to the successful development of a perfected vibration method of making concrete masonry units. After years of investigation Besser now brings out machines combining the plain pallet stripper principle with vibration.

The Besser Plain Pallet principle still is the most outstanding development in the history of the Industry. This combined with the Flam and other vibration methods that have stood the test of over eight years in the production of blocks that have proven their durability in actual building construction is another big step forward.

You are cordially invited to see the Besser Vibrapac Plain Pallet Strippers together with other new equipment, which Besser will display at the Concrete Industries Exposition at the Hotel Sherman in Chicago, February 7, 8 and 9.

Sincerely yours,

J. H. Besser

J. H. Besser, President
Besser Manufacturing Company

Lightweight Building Unit and Cambered Shingle

Concrete Specialties Made By the Basalt Rock Co.

By NATHAN C. ROCKWOOD

Left: Louis Cassayre, quarry superintendent. Right: A. G. Streblow, president

Napa, Calif., is beyond the northern end of San Francisco Bay. It is a small city in the fruit belt, not especially favorably located for industry. The East Bay metropolitan district of San Francisco — Richmond, Berkeley, Oakland, etc.— is about 50 miles distant. In spite of these handicaps A. G. Streblow, and his associates in the Basalt Rock Co., have built up a concrete products specialties business which covers a wide territory exclusively by truck transportation.

Also Operate Crushed-Stone and Sand and Gravel Plants

The Basalt Rock Co. has been in the crushed stone business for many years, and with the completion of nearby paved highways its proprietors had to look for new fields to conquer. This was partly solved recently by taking contracts for rhyolite rip-rap (from an adjacent quarry) which is conveyed from the quarry and screening plant by cableway to a barge loading terminal on Napa River at the northeast end of San Francisco Bay. In the meantime the company had acquired a nearby sand and gravel plant, and had discovered a deposit of pumicite adjacent to its basalt rock quarry. These started a concrete products business, which at this writing, is probably unique for this country. In the illustrations on the following pages may be seen some of the unusual equipment and products manufactured.

Pumicite, as probably most readers know, is a spongy looking form of silica. The pumicite from this deposit is quite tough and has to be crushed and screened, yielding a well graded, lightweight aggregate with appreciable crushing strength. Concrete made with it weighs only 60 to 65 lb. per cu. ft. The difficulty was to find a block machine which could handle this kind of a concrete mix.

Knowing that similar pumicite concrete blocks were being made in Germany, Mr. Streblow went abroad and purchased a specially built machine from A. Syre, Bendorf am Rhine, which compacts the concrete in the block molds by a combination of jolting and tamping. The machine makes five standard 8x8x16 blocks or six 6x8x16 partition blocks at a time. The pallets are oiled pieces of fibre board inserted by a workman on one side of the machine. A pallet is carried through to the other side on a conveyor, the moulds dropped on it by machinery, and then filled by a hopper which moves across the top of the moulds. The machine platform supporting the moulds is then given a few jolts, the tampers applied, the moulds refilled, tamped again, and the moulds stripped. The pallet containing the blocks is transferred to a conveyor consisting of two endless parallel wire ropes, moving over pulleys at about 30 ft. per min. The pallet resting on these parallel wire ropes is carried to the storage or curing yard.

In addition to standard wall blocks special shapes are made such as blocks with provision for window sash, and headers over windows with provision for casting a reinforced-concrete beam or lintel in place, wall slabs, etc.

Cambered Shingles

While abroad Mr. Streblow visited England and was much impressed by the possibilities of a concrete shingle he saw being made and used there. All previous attempts to make concrete roofing had imitated clay tile, but here was a nearly flat shingle of concrete more like a slate shingle, yet cheap enough to compete with felt-asphalt roofing shingles, and appreciably cheaper than its nearest competitor, the cement-asbestos shingle.

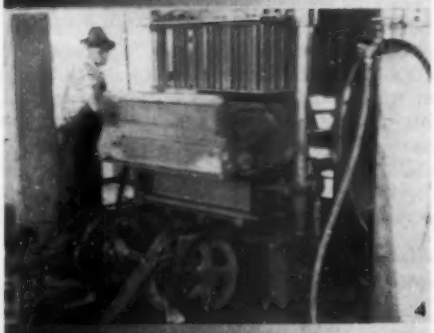
The shingles are ½ to ⅞ in. thick, 6½ in. wide and 12½ in. long. They have a camber of about ¼ or ⅜ of an inch, so that laid on a roof there is only a line of contact with the shingle below. This is the secret of their weather resistance, for water, even when driven by a wind blast, will not creep up by

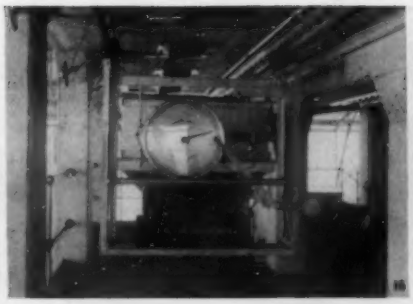
Modern plant on the southern edge of Napa, Calif., of the Basalt Rock Co. for making special concrete products

SOMETHING NEW

In Concrete Products

Fig. 1: General view of pumicite block machine, showing working floor above, under the aggregate bunker. Fig. 2: Block machine from the other side, showing plyboard pallets used. Fig. 3: Moulds ready to be lowered to pallet. Fig. 4: Filling moulds with traveling hopper. Fig. 5: Stripping the moulds. Fig. 6: Side view of block machine. Fig. 7: Some of the concrete shingles in the storage, outdoor show room. Fig. 8: How the shingles are laid on a roof





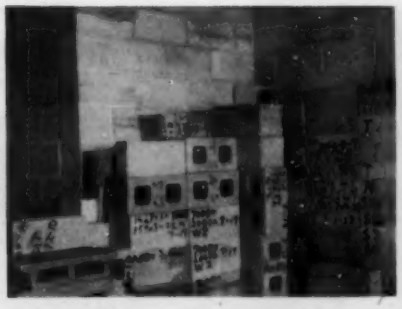


Fig. 15: Aggregates are received on this side of the plant. Fig. 16: One of the weighing batchers for aggregates. Fig. 17: Corner of the laboratory store room showing many experimental blocks

the shingles so laid as to furnish planes of contact, capillarity would cause water to creep up and over the inside ends.

The shingles are very easily placed. They have two ribs projecting slightly from their under side to hook over the nailing strips, and each shingle has two nail holes. Should a shingle become broken or cracked, a new one is readily inserted even from the inside, for it is claimed that no sheathing or tar-papering is necessary or desirable with these roofs.

The shingles are made on a rather complicated little machine, manufactured by Powell and Hill, Ltd., Croyden, England, in a continuous process. The sand and cement mixture (two sizes of sand split on the 30-mesh) is fed continuously to a line of pallets end to end, where it is spread and compacted by passing under rolls. As the pallets come out of the machine they pass under a cutter or separator and under a "salting" device which sprinkles color or other surfacing material on the thin little concrete slab. It is then split lengthwise into two shingles and the edges trimmed. A wire rope conveyor, 200 ft. long, takes the pallets down a gallery, where the pallets are lifted off by hand and placed on shelves for 24 hours in a moist curing cabinet. After

Ready-mixed concrete truck taking a load

curing, the pallets are removed from the cabinet shelves and sent the rest of the journey on the rope conveyor. At the out end of this conveyor is a specially designed dipping and soaking tank, where the shingles are given a bath of iron sulphide or some other chemical "to set" the color in them.

The shingles are removed from the pallets by hand at this point and placed in racks or baskets, which are placed on an endless conveyor, as shown in one of the views, and these travel submerged in the tank at any speed desired, giving the required time for soaking. The baskets of shingles are removed at the outside end of the tank and the shingles stacked for storage and curing. The empty pallets continue on the wire-rope conveyor to a gravity roller conveyor, which makes a circuit and returns them to the lower strands of the wire-rope conveyor, going in the opposite direction, back to the shingle machine. Here they come off the conveyor and by a roller conveyor are run under a spray hood for an oil bath, and thence back into the shingle machine. The machine makes 4000 shingles an hour and requires four to six men to serve it.

Aggregate Handling And Batching

The plant is designed under and around a concrete bunker 16 ft. wide and 70 ft. long with bins or compartments for 10 sizes of aggregates. The aggregates are received by truck, dumped into a hopper and elevated to the tops of the bins by a 24-in. Link-Belt belt

(Continued on page 69)

Fig. 9: Shingle machine, with feed hopper removed. Fig. 10: Side view of shingle machine, feed hopper removed. Fig. 11: Another view of shingle machine showing the edge cutters or trimmers (right-hand corner) Fig. 12: End of 200-ft. wire rope conveyor and baskets for dipping shingles in color-fixing tank (right). Fig. 13: Outcoming end of color-fixing tank. Fig. 14: Color-fixing tank with variable-speed chain driven conveyor

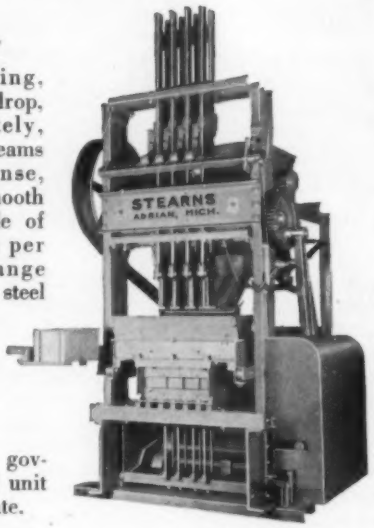
BUY A MACHINE OF *Proven* WORTH

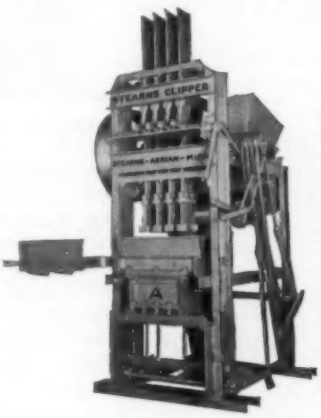
STEARNS JOLTCRETE MACHINE

Not an ordinary vibrator—not just a tamper or press assisted by vibration—but a machine that vibrates the concrete in the mold box with vibration of limited amplitude—vibration under pressure—subjecting the concrete to 7,200 blows per minute. Maximum number of blocks per bag of cement. Blocks are clean cut, true to size, uniform in texture, no planes of weakness, no core bar ridges. Blocks lay up with straight, true mortar lines. Operates automatically, three cycles per minute and at each cycle makes three 8x8x16 or two 8x12x16 blocks, or eight 8x3x18 blocks, twenty-four bricks or any other combination of units fitting a mold box 18x24 in., 12 in. high. Uses your present cored pallets or inexpensive new ones. Made also in two smaller sizes. Fully protected by U. S. and Canadian patents.

STEARNS
Power Stripper

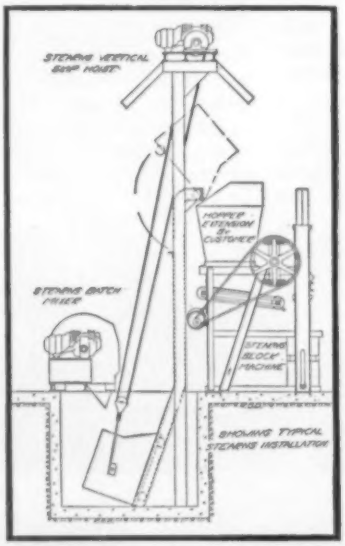
Multiple-bar tamping, 4 in. greater tamp drop, bars drop alternately, eliminating vertical seams in block. Makes dense, strong blocks, with smooth pressed tops. Capable of making six blocks per minute. Quick change mold box with heavy steel frame and reversible liner plates of abrasion resisting steel. Feeding, tamping, stripping and finishing operations may all be governed to suit size of unit and kind of aggregate.





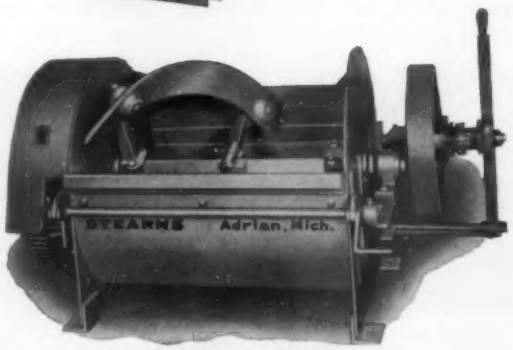
STEARNS
Clipper Stripper

Ideal for small plants and, in batteries, achieves low production costs in large plants. Multiple bar tamping produces dense, uniform blocks, increases block yield per bag of cement. Available in five models with power tamping from manual feeding and stripping to the all power outfit, Model A, shown here. Down-face attachment available.



STEARNS SKIP LOADERS

for charging dry materials into elevated mixers or for elevating mixed concrete to feeding hoppers. Independent and mixer drive types. May be used with any make of mixer. Proper track and cable lengths permit wide range of application.



STEARNS MIXER

The mixer with interchangeable, renewable bar type liners of tough, abrasion resisting steel. "Sterloy" ribbon blades. Heavy steel shell electrically welded to steel ends. Quick-opening, tight-locking door. Low charging height. Large ball bearings perfectly shielded. Pulley, V-Belt or Gear-Head Motor Drive. Skid or truck mounting.

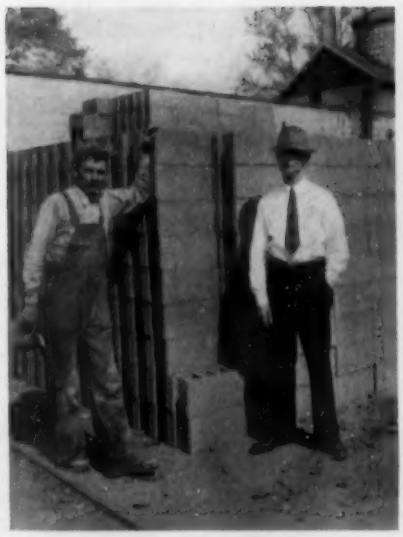
Complete
Concrete Products Plant
Equipment

STEARNS
MANUFACTURING CO. - ADRIAN, MICH.
GENE OLSEN, PRESIDENT

Write for folders on the machines you are interested in

Improve Cinder Crushing For Better Products

By BROR NORDBERG



Robert Jardine, superintendent, left, and H. P. Bennett, president, who have been together continuously for 33 years in the concrete block industry

H. B. Bennett, president of Bennett Concrete Stone Co., Cleveland, Ohio, has completed 34 years in the manufacture of concrete products at Tourney and Warner roads, Cleveland, Ohio. Robert Jardine, his plant superintendent, has been with Mr. Bennett for 33 consecutive years and practically all the plant employes have seen a quarter of a century or more service.

For such a record we must take off our hats to Mr. Bennett, in these days of labor unrest and agitation with strained employer-employe relations. Our present period of industrial strife isn't the first that Mr. Bennett has weathered successfully during the 34 years' operation of his plant. Incidentally, Mr. Bennett has been a producer of sand and gravel for many years and at one time was president of the Hugo Sand Co. of Cleveland.

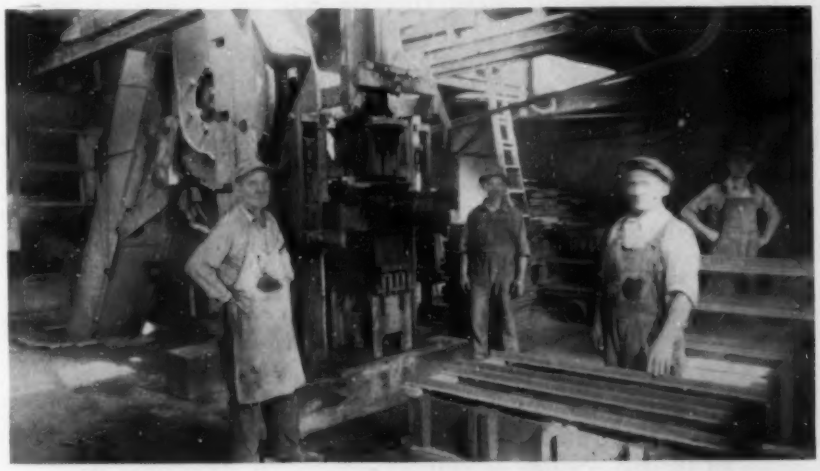
Until 1937, all products were manufactured from gravel concrete, when the plant was re-modernized for the production of cinder units exclusively. This change was made to open up new markets in the heavier types of construction where a lightweight unit has particular appeal to the architect and builder due to certain inherent properties of this unit.

In addition to a big tonnage of concrete block for larger buildings, the company also has very effectively merchandised cinder concrete masonry for homes, garages, filling stations and other smaller structures where lightweight, insulating concrete in above grade construction has particular appeal.

Thirteen individual family dwellings of concrete masonry were sold the first year and more than twenty in 1938. Promotion is largely through direct contact with architects and builders, supplemented by calendar and blotter direct mail pieces which have been effectively distributed. In 1937 the plant was rebuilt, and large-capacity, fully-automatic Besser stripper and cinder-crushing equipment was installed, making the plant one of the most modern in the city.

Crushing and Screening Cinders

Cinders obtained from a local steel company are brought to the plant by truckers and dumped into a hopper, from which they are reclaimed by a bucket elevator to the crushing plant. The crushing plant represents in its design sound practice in the handling of a tough, abrasive material, such as cinders. Cinders from the elevator head are carried over a belt conveyor into a 16-in. New Holland slow-speed hammer mill. The head pulley of the belt conveyor is a magnetic separator which catches tramp iron that may be in the cinders and diverts it from the hammer mill.



Fully-automatic tamping machine recently installed. Cars on narrow gauge track are used to transport block into the kilns, to the right

The hammer mill is capable of handling the larger cinders, reducing them to sizes which can readily be handled by roll crushers with efficiency. Discharge from the hammer mill is successively put through two sets of roll crushers, giving each unit the opportunity to do its work effectively and without too great a ratio of reduction through either machine. The rolls are 16-in. in diameter and are manufactured by the New Holland Machine Co., New Holland, Penn.

Faces of the upper set of rolls are ribbed to lessen the "riding" of larger cinder particles over the faces. One of the principal causes of uneven wear of roll faces and early replacement is the failure of large particles of any material being crushed to be "taken in" by the rolls.

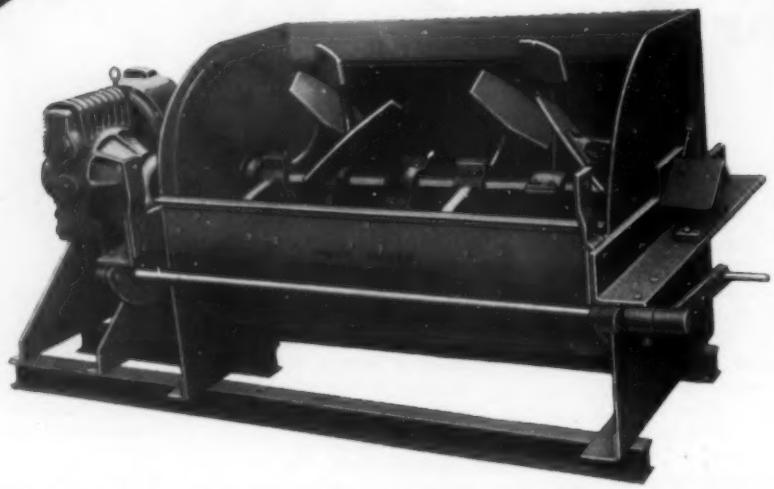
The second set of rolls are smooth-faced, and their work is a small ratio of reduction. Wearing surfaces are segmented and readily replaced without dismantling the machines. The setting of the rolls is adjustable for either stage of reduction, which gives to the operator considerable latitude in controlling the gradation and percentage of fines in the cinders. Capacity of this particular unit is 15 tons per hour.

Crushed cinders are stored in a 50-ton Marietta concrete stave silo, which has

NEW DESIGN

REVERSE ACTION PADDLES KEEP THE MATERIAL MIXING TWICE AS FAST, WITH LESS FRICTION TO THE LINERS

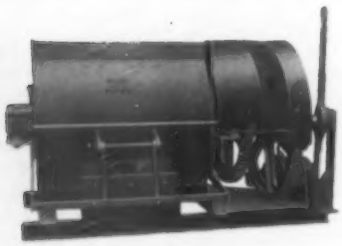
1. Less wear to liners and blades.
2. Lower HP rating.
3. Low charging.
4. Built in 5, 7, 12, 18, 30 & 40 cu. ft. capacities or larger.
5. Made in end, bottom, or side discharge.



6. Oversize in capacity.
7. Gives a better mix in less time, due to the paddle arrangement.
8. Can be had with a geared head motor drive, belt, V-belt, or motor gear drive, with skip hoist or mounted on trucks.

The above Mixer shows the direct gear-in-head motor drive. Note the close and compact setup—no clutches or pulleys. It is completely controlled with electric starting, stopping, and reverse switches.

Note also the paddle arrangements—the secret to a proper mix in less time. Let us prove it with a Multi-Mixer!



Motor gear drive. Can be had as a combination side or end discharge.

Belt drive, side discharge or end discharge. Built sturdy for better mixing.

We have a complete line of concrete products equipment—Tampers, Power Presses, Hand Press Machines, and Variable Speed Vibration Machines.

SEE THEM AT THE CHICAGO CONVENTION, FEBRUARY 7-8-9, 1939

Booths 46-A, 46, 47, and 48

REPRESENTATIVES

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CUNNINGHAM-ORTMAYER CO.
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THE SUPEROCK COMPANY
Empire Building
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LOWE MACHINERY COMPANY
612 N. Michigan Avenue
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ROY C. WHAYNE SUPPLY CO.
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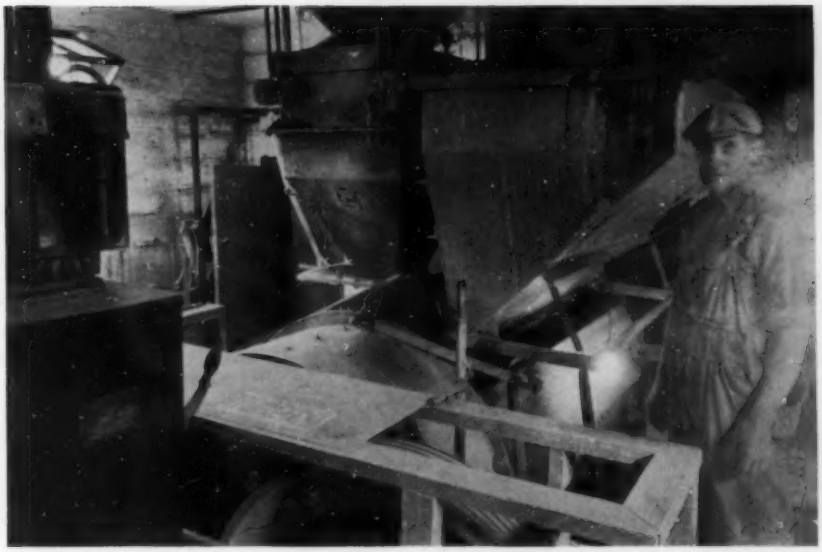


Graded cinders are measured and cement is weighed into a 42-cu. ft. concrete mixer

been waterproofed internally. Cinders are measured out in a hopper and portland cement is weighed into a 42-cu. ft. Besser concrete mixer which serves the new fully-automatic block machine. The block machine, on which all standard units are manufactured, has a capacity of 6 to 7 standard 8- x 8- x 16-in. units per minute. Other units manufactured on this machine are 4, -6 and -12-in. thicknesses, with two 6's and two 12's made in one operation, using wood pallets and two off-bearers.

Standard fractions are manufactured by another Besser machine. Other units made are chimney blocks, chimney caps, lintels, sills and precast doorsteps and risers. Low pressure, steam curing is done in 10 kilns, 70 ft. in length, having a capacity of 100 rack cars.

Normally about 30,000 units are carried in stock, but on occasion, where early handling is desirable with a minimum of breakage, high early strength cement is used. Standard units, under compression test, withstand a load of 2000 p.s.i. at 28 days where 1200 p.s.i. is required by city code. Louis H. Bennett is general manager of the company.

Nailable Gravel Concrete

ENGINEERS of the U. S. Reclamation Service have been experimenting with concrete made of coarse aggregate and cement with no sand or fine aggregate, with the idea that cheap walls for small dwelling houses could thus be made. The views herewith show test cylinders made at the Grande Coulee Dam, Wash., last summer.

The test cylinders were made with ¼-in., ⅜-in. and ½-in. aggregate with as little as 2 sacks of cement per cu. yd. It was said that this concrete has sufficient crushing strength to pass the requirements of the federal building code for one-story houses or bungalows. The concrete is nailable, and if stuccoed on the outside and plastered on the inside, on firring strips, would evidently provide excellent building walls.

Concrete Specialties

(Continued from page 65)

conveyor, completely enclosed, as shown in one of the views. A shuttle conveyor receives the material and distributes it to the proper bin.

Cantilevered out from the concrete bunker in three directions are 50-ft. span steel trusses, which together with the space under the bins provide unobstructed working floors. The bottom chords of the trusses are flush with the bottoms of the bins, and the traveling batchers can receive batches from any bins. The batcher is equipped with Fairbanks Morse dial scales of 5000 lb. capacity. The mixers are the open-top type, placed with their tops flush with the floor. They discharge below to the block machine, to transit-mix trucks (Jaeger truck mixers on Autocar chassis, 3 and 4 cu. yd.) or to the shingle machine. The cement is handled in bags on the working floor. On this floor is also a color mixer, a laboratory, store rooms for cement, color, etc.

In keeping with good merchandising principles, the company chose to make and sell specialties with a trade-marked name. The name selected is "Basalite," derived presumably from the parent company's basalt name. This word Basalite in concrete block letters 6 ft. high is quite conspicuous from the state highway which runs by the plant. The plant is some 200 ft. back from the highway on a raised concrete pavement, this open place serving as the storage and open-air show room for the plant's products.

The plant itself is very striking in appearance from the highway. It is made of structural steel with special concrete panel walls, the block and shingle machines being under the bins and not enclosed. Visitors are welcome and can not fail to be interested both in the plant's operations and the products.

BREMERTON CONCRETE PRODUCTS CO., Bremerton, Wash., is defendant in a suit by 11 property owners who asked to have the plant declared a public nuisance and that it be enjoined from operation. The plant was established in its present location by its owners so that it would be out of the city limits. Annexation of the Daly addition by the City of Bremerton brought the plant within the city's limits. The property owners in effect are practically asking the court to confiscate the property of the concrete products company.

Left: Mr. Patch's experiments with concrete of fine crushed stone aggregate, using two sacks of cement per cubic yard, for house construction. Right: Cylinders made of ⅜-in. stone and no fines

One Man Batching Plant

Solve Truck Lost-Time Problem

By GEO. D. ROALFE

West Coast Editor

Only one man is required for operation of the concrete batching plant of Graham Bros., Inc., Los Angeles, Calif., which has a capacity of 100 cu. yd. per hr. Incorporated in its design are many novel and advanced ideas, and the method of operation is very efficient.

Storage is provided by four cylindrical steel bins. The main aggregate bin has a capacity of 350 tons and is divided into four compartments, two of which comprise one-third and two hold one-sixth of the total capacity. The two larger compartments store No. 3 crushed rock or ¾-in. gravel and No. 2 holds crushed rock or 1½-in. gravel. Smaller storage bins are used to accommodate pea gravel and rock dust or blending sand. The concrete sand bin has a total capacity of 170 tons and contains only one compartment. An additional aggregate bin of 60-ton capacity is located between the two bins previously mentioned, and contains two compartments with capacities of 25 and 35 tons, respectively. This is for reserve storage and is not now in use. Cement storage is provided by a 600-bbl. cylindrical steel bin with three compartments, each of which hold 200 bbl. The top of the bin has a revolving head fitted with three openings, each discharging into a separate compartment. This rotary head is controlled from the batching floor by a cable winch.

The entire plant framing is of structural steel, having sections larger than usual practice to resist earthquake stresses or lateral forces in addition to the normal dead and live loads. All foundations and pits are of reinforced concrete.

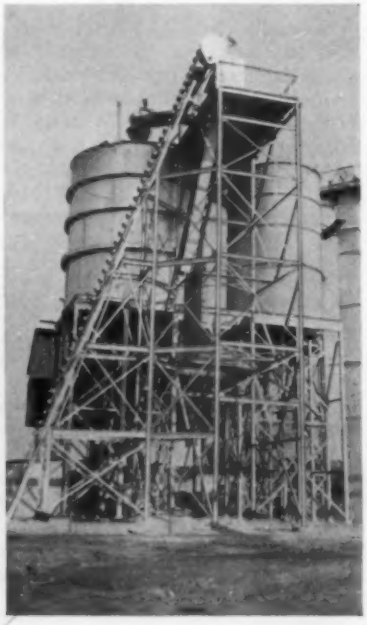
All materials are delivered to the plant by truck. Rock and sand are dumped into a reinforced concrete, steel-lined hopper bottom trap capable of handling 30 tons, from which it is fed into a bucket elevator, 84-ft. centers, equipped with a clutch brake. The gate on the aggregate hopper is controlled by a hand wheel at ground level. The elevator discharges to a boom-type, 24-in. belt conveyor, 23-ft. centers, which can be made to register with any of the four bins in the main aggregate bin, either of the two bins in the surplus aggregate bin or with the sand bin. Control of the aggregate trap gate and the selective registering of the boom conveyor are the only pieces of equipment in the entire plant which cannot be operated from the scale house.

Bulk cement is dumped from trucks into a 115-bbl. capacity cement bin supported on the concrete walls of a pit 10- x 10- x 24-ft., which is covered with a corrugated iron, hipped roof. Cement is fed by means of a 12-in. screw conveyor, 18-ft. long, to an enclosed belt bucket elevator. From the bucket elevator, cement is transported to the selected compartment by a screw conveyor, belt-driven by a 5-hp. motor.

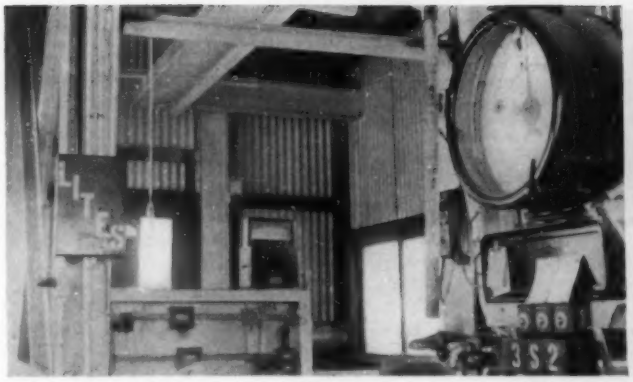
Mercury Tube Controls Bin Level, Screw Conveyors and Elevator

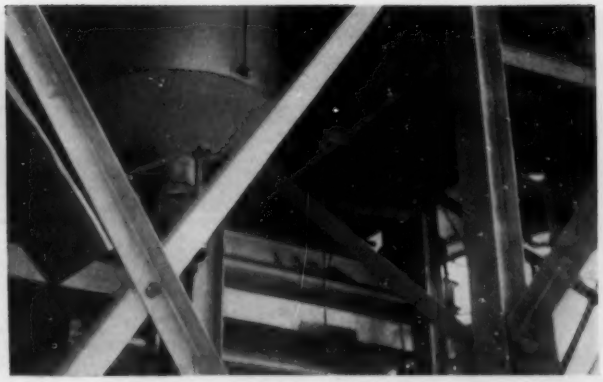
Each of the cement compartments is fitted with a moving paddle governor actuated by the cement when the bin is full. This governor operates through a mercury tube control which stops the lower screw conveyor, then the bucket elevator and upper screw conveyor, allowing sufficient time interval for the line to clear. If desired, the controls can be set so that the screws and cement elevator will automatically start when the cement level drops in the bin being filled.

Located directly under the center of the bin group and at right angles to the material receiving ends is the mixer truck driveway. On the north side, overlooking the entire operation, is the batch or scale house which contains the weighing devices, the switch board, and control devices required by the plant.



Left: Truck discharging aggregates into hopper. Elevated scale house to the left; large bin has four compartments for coarse aggregates. Center, below: Loading transit mix truck. Right: Transit mix truck driveway in center, boom type conveyor at top of plant, and coarse aggregates bin to the left and sand bin to the right





Left: Automatic weighing scale and push button controls used in batching. Right: Batch water tank, top of weigh hopper, and one of three aggregate conveyors, above.

Selected aggregates are transported from the bins to the weigh hopper on three short belt conveyors; one for sand, and the other two for the ¾-in. and 1½-in. aggregates, respectively. Each conveyor is chain-driven by a 5-hp. motor with a 3-hp. "jerk" motor. By utilizing these "jerk" motors, additions of 20 lb. per jerk can be added to previously weighed material. Pea gravel and rock dust discharge directly into the weigh hopper. The bin gates are all operated by compressed air at 75 p.s.i. furnished by an Ingersoll-Rand compressor driven by a 20-hp. motor.

Weighing equipment comprises two Fairbanks Morse scales, a 20,000-lb. five-beam scale for aggregates and a 3000-lb. single beam cement scale. After the weights have been set up, successive batches are automatically weighed by means of a photo-electric cell control. The aggregate weigh hopper can accurately proportion five classes of material without resetting. Cement is transported directly from the storage bins by one or both of two screw conveyors to the cement weigh hopper.

Water is measured with a Spangler water meter from the water batch tank, which is suspended alongside the cement weigh bin. It can be added to the load with the cement, thus assisting in washing down the chute, or it can be added separately.

As the discharging chutes of both the aggregate and cement batcher are telescopic, they can be readily raised or lowered, preventing spillage when the trucks are loaded. These chutes are all fitted with either air or electric vibrators which eliminate the hanging up of material. All storage bins and chutes discharge at an angle of 60 deg. to the horizontal, which, it is claimed, provides a free flow of materials but also reduces segregation to a minimum.

One man not only batches all the materials but takes orders, makes out shipping tickets, and orders and replenishes stock. The telephone has three extensions: in the scale house, on the ground, and at the top of the plant.

Solve Problems of Lost Time for Trucks

Climaxing 10 years' experience and study, Garvin Pelsue of Graham Bros., Inc., has worked out some advanced policies which have gone a long way in solving the lost time problem of operating transit mixer trucks.

The first attempt to regulate lost time was to base quotations on a stipulated price which contained a free standing time allowance, excess standing time to be charged for at a fixed rate. This procedure did not work out satisfactorily because, if rigidly applied, it created considerable customer resistance and frequently resulted in inequalities.

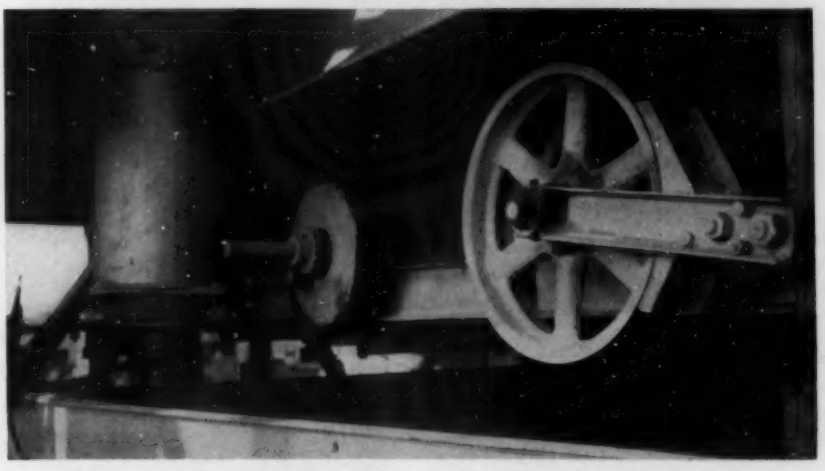
It was then decided to departmentalize the company's transit mix activities. In order to identify their product it was named, Grahamix. All equipment, such as truck units, transfer rigs, batching equipment and portable job bins were transferred and charged to this department, and it was given sole responsibility for pricing, sales and service. It is not only charged with the investment, operating and maintenance charges for all equipment used, but it also buys its rock, sand and cement from the parent company just as any other customer. An aggressive policy has enabled this department to keep its equipment busy an average of six hours per day.

In establishing fixed costs under the new departmental set up, the time factor per load was considered the most important variable cost item. The truck mixer must be kept consistently busy to keep this factor down. Unloading or standing time affects earnings more than any other variable factor. The first attempt to minimize this loss failed because the arrangement worked only as a penalty on the customer without the possibility of his benefitting by cooperating. It was finally decided to base the rates on the following conclusions:

1. The sale and delivery of mixed concrete contains more of the sub-contractor relation between customer and operator than is true in the sale and delivery of individual building materials.

2. All jobs by their nature do not present identical problems.

3. All customers are not equally economical to serve. *(Continued on page 77)*



One of three conveyors feeding weigh hopper. Note chain drive and braking device

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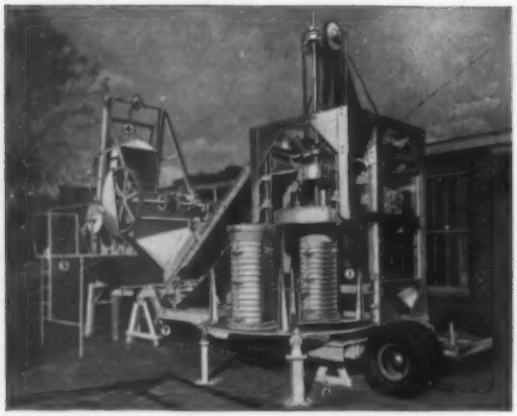
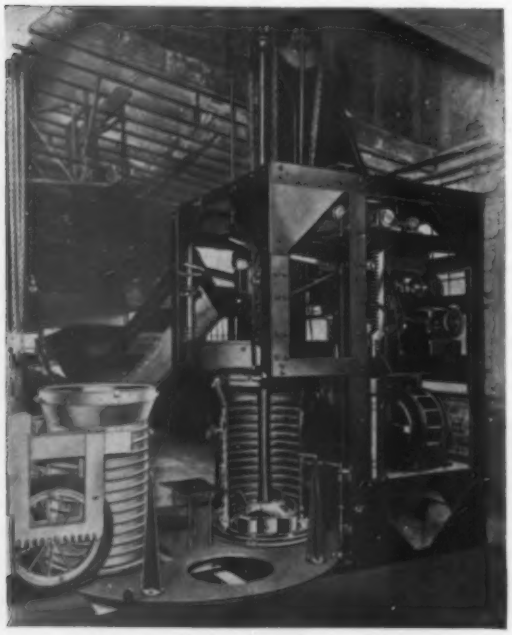


Model T Portable Plant ready for operation



Model T for permanent plant. All plants equipped with this money-making machine entitled to lease Portable Unit.

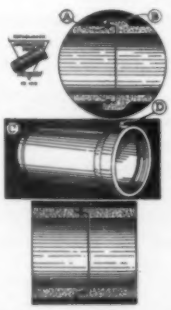
1. The New Portable Dual Packer-Head pipe machine cuts the transportation cost out of pipe manufacturing completely. Vastly increases your trade territory and makes it possible for you to meet competiton almost anywhere. Uses local labor and material and manufactures the pipe right on location.

What better arguments could you present in securing pipe contracts—contracts which will mean greater profits for you than ever before?

2. McCracken concrete pipe as made with the Dual Packer-Head machine save from 10 to 15% on cement, because New Roller Head permits use of more coarse aggregates. The New Sealtite joint, together with the perfect alignment entirely feasible with our new Alignment Perfector, prevents infiltration and practically eliminates maintenance costs. McCracken pipe more than withstand all standard tests and are preferred by the most exacting engineers. The popular length of these highly superior pipe speeds up installation and reduces pipe-line construction costs.

McCracken pipe are now being made by 45 domestic and 21 foreign manufacturers.

Send for Free Folder on New Portable Concrete Pipe Machine and unique leasing policy.



The New Sealtite Joint, which adds many years of low-cost service to the sewer line, can be made on either bell-and-spigot or tongue-and-groove pipe. A, above, Groove in bell-and-spigot. B. Joint compound — either bituminous or cement mortar. C, Half-round groove on spigot end of pipe. D, filling-hole on bell end of pipe.

CONCRETE PIPE MACHINERY CO.

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AVOID THIS **ATTAIN THIS**

An Unusual Sales Method

Merchandises Production Through Building Supply Dealer

Left to right: A. H. Patterson, secretary; V. R. Dempsey, bookkeeper; and E. P. Scholtz, plant superintendent

An efficient plant layout with modern equipment and a merchandising plan tried by very few manufacturers of concrete masonry are interesting features of the Cinder Block Corp., large Baltimore, Md., cinder block manufacturer. The company, which has its plant on the Western Maryland railroad, was incorporated in 1923.

Cement is received by rail in cloth sacks and cinders are delivered either by rail or truck. Cinders are purchased by contract, already crushed and graded from ⅜-in. down, but the company has a roll crusher for standby service, having at one time handled its own cinders.

Four block machines are arranged in a row, lengthwise of the building, so that the distance into the curing kilns is very short. Three Anchor Jr. strippers with power tampers, formerly used for the manufacture of standard concrete block, have been retained for standby service and for making various specials. The new Stearns Joltcrete, however, now makes all the standard block.

The Joltcrete machine, installed in August, 1938, vibrates the concrete in the mold box, while under pressure, at the rate of 7200 vibrations per minute. The mix used is practically the same as that for tamped block. About ¼ gal. of water is used for each cubic foot of concrete.

Materials are handled and the mixing of concrete is done on an elevated floor with individual mixers serving each machine. Three Besser mixers of 18-cu. ft. capacity are operated with the Anchor machines, and the vibrating machine receives its feed of concrete from a 28-cu. ft. Stearns mixer.

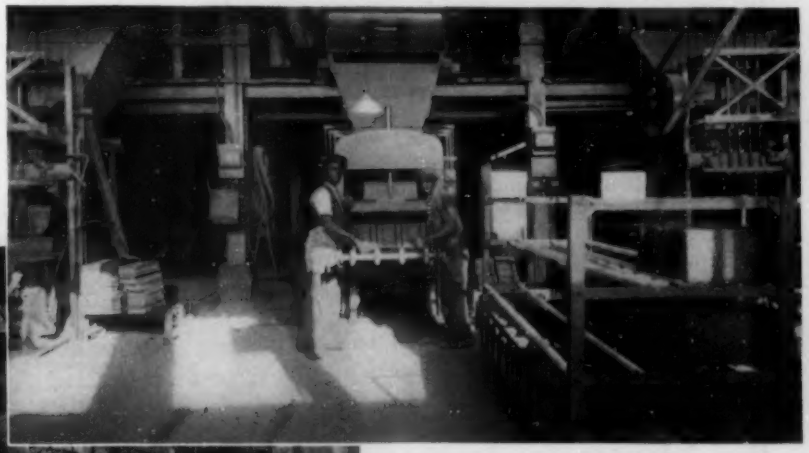
Normal production averages between seven and eight standard block per minute, including time out for adjustments, with one man to operate the machines, two off-bearers, a mixer operator and a fifth man to handle steel racks into the kilns.

The vibration speed on the machine is constant with an amplitude, or range of vibration, which is adjustable. About 2½ cycles of operation are completed per minute. The machine is powered by a 3-hp. electric motor and another, a 5-hp. geared-head motor, drives the vibrating mechanism. With the mix of concrete used, compressive strengths average between 900 and 950 p.s.i. at 28 days, based on gross area, with a city ordinance requirement of 750 p.s.i.

A standard portland cement is used in the manufacture of all units, and the low pressure steam curing period is 24 hr. in summer as well as in winter. Curing capacity is about 12,000 units in 10 kilns, using a railway track system for handling.

Merchandises Through a Dealer

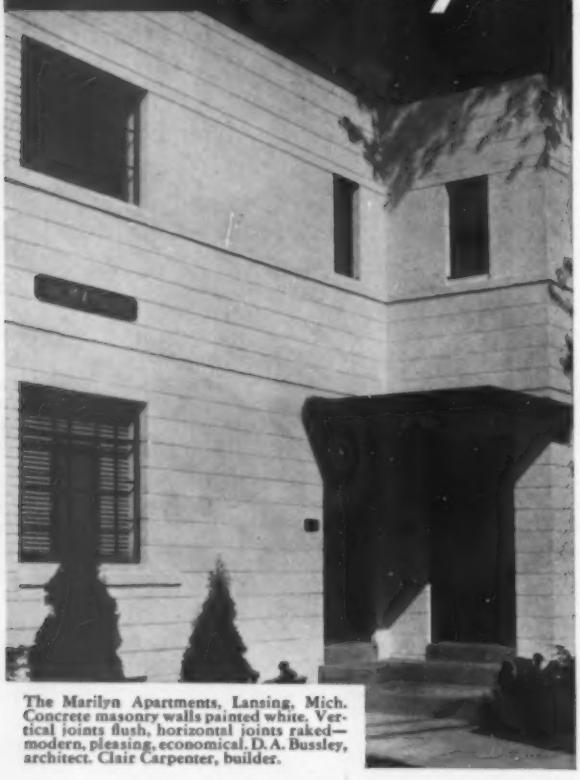
Until late last Summer the company had its own sales force, but sales are now handled exclusively by the Monu-



Above: New vibrating block machine in operation. Note relation of mixing equipment to the main floor

Left: The mixer floor is elevated, over the block machines, with separate mixers for each machine

It's Concrete Masonry...



The Marilyn Apartments, Lansing, Mich. Concrete masonry walls painted white. Vertical joints flush, horizontal joints raked—modern, pleasing, economical. D. A. Bussley, architect. Clair Carpenter, builder.

and everybody's proud

WHEN you go after concrete masonry building jobs, you talk economy, durability, strength and fire-safety.

But how about *architectural beauty?*

"Styling the product" is the key to greater sales in autos and radios. And it sells concrete masonry jobs, too. Owners, builders and even architects are often surprised at the varied and striking architectural effects obtainable with this versatile material.

Why not get together with a progressive architect or builder and *show* your community?

New Sales-Boosting Booklet

"Concrete Masonry for Better Buildings," is just off the press. It's a honey! 60 of the best-looking photos of concrete masonry buildings ever assembled. Handed out to builders, architects, public officials and owners, this new book will help stimulate concrete masonry sales. Write for a copy.

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WARNING

THE STEARNS MANUFACTURING CO., of Adrian, Michigan, is the sole and exclusive licensee of the basic and broad patents, and patent applications, on JOLTCRETE vibration block machines, which we own. Among the many revolutionary features embodied in these machines is the application of pressure on the concrete mass while the concrete mass is subjected to vibration.

Any manufacturer of machines illegally duplicating or copying features protected by the claims of patents already issued, and to be issued under pending patent applications, will be prosecuted to the full extent of the law.

All users of block machines should guard against the purchase and use of infringing machines in that they are equally liable to infringement prosecution.

JOLTCRETE, Inc.

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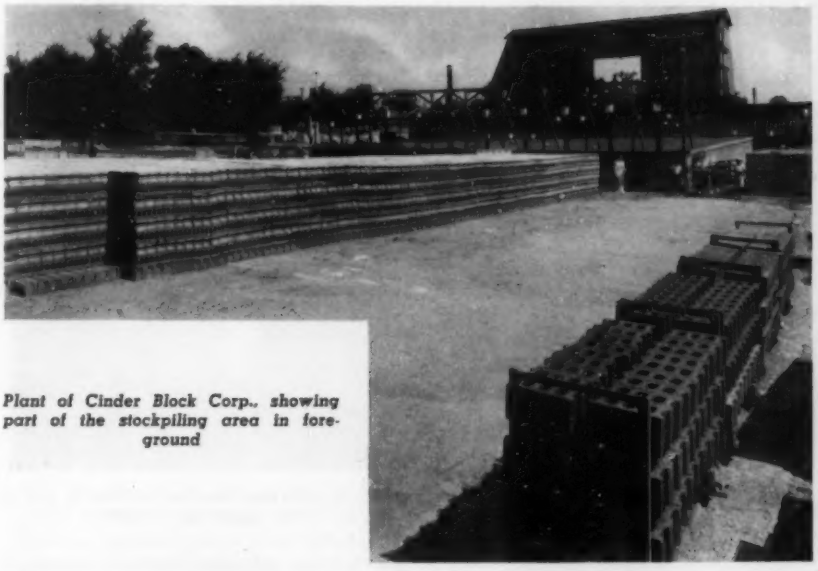

Plant of Cinder Block Corp., showing part of the stockpiling area in foreground

mental Brick and Supply Co., large Baltimore building supply dealer. The contract drawn up between the two organizations is for one year in order to determine the success of the plan.

From results obtained up to date, it is apparent that much business is being secured which very likely would not have been had through a selling organization maintained by the block company. This is particularly true in selling cinder block backup along with brick veneer to a general contractor and builder.

With the present sales arrangement, the Cinder Block Corp. has no salesmen and is concerned only with manufacture and the delivery of units, by truck, from the yard. The two offices have a direct switchboard connection, for receiving shipping instructions from the building supply company and for relaying orders received direct by the cinder block concern to the selling company. The sale of products shipped into Washington, D. C., are handled direct.

Ordinarily a sales force of three to five men would be required by the block manufacturing company to handle sales within a restricted territory of about 40 miles radius. There is a decided sales advantage gained through the experience and wider scope of the larger selling organization of the building supply dealer. The latter company has one salesman who devotes his entire time to selling cinder block, exclusive of other building supplies. In addition, its regular force of 11 salesmen, widely experienced in general building materials, is pushing the sale of cinder block along with other materials.

To keep the company identity, the name "Cinder Block Corp." is retained in architect's specifications and all mailing pieces, sales literature, and in shape catalogs, using very conspicuous type.

C. W. Patterson is president and treasurer of the Cinder Block Corp.; G. W. Creighton, vice-president; A. H. Patterson, secretary; and E. P. Scholtz, superintendent of the plant.

Increases Ready-Mix Facilities

VINITA READY-MIX CONCRETE CO., Vinita, Okla., a new concern last year, is reported very active and has added several thousand dollars worth of equipment to its plant to take care of increased demands for concrete. Albert von Unwerth and Fritz von Unwerth are owners of the company.

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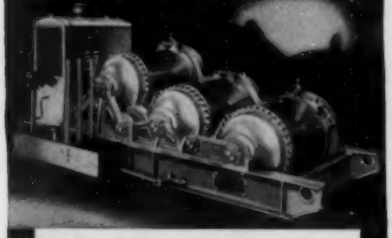

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1: Giant Expanding Frictions, as on $15,000 Shovels, giving easy finger-tip control of loads.
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Standardized construction (only 3 basic types for 30—100 H.P.) means big savings, lower prices. Get new Catalog.
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A new precision rapid production block machine. The latest in vibrating and pressing. Introducing new features of importance in making perfection blocks.
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Complete equipment for making concrete, cinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns mixers, pallets, Straublox Oscillating attachments, etc.

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Because it was developed thru 16 years experience in the manufacture of pipe itself. Every part is precision-made to produce the highest quality pipe. Available in Bell End and Tongue and Groove types for 6" to 48" pipe.

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UNIVERSAL CONCRETE PIPE CO. Inc.

COLUMBUS, OHIO

Coloring Concrete Floors by New Method

THE MASTER BUILDERS CO., Cleveland, Ohio, has developed the "Colormix-KuroKrome" method of coloring concrete floors, which consists of applying a penetrating, surface-sealer to match the colored concrete after it has hardened. "Colormix" is produced as a fine dry powder with great dyeing power and contains a minimum of inert oxides, while "KuroKrome" cures, protects and finishes the floor when applied by brush as soon as the "Colormix" concrete floor has hardened. KuroKrome is claimed to provide an airtight seal which holds the moisture in the concrete; to check efflorescence; to dye out any non-uniformity in the concrete surface; to prevent the absorption of stains; to provide a smooth, non-slip surface; and to bond perfectly to the floor.

Unique Conveying System For Ready-Mixed Plant

SPARLING READY-MIXED CONCRETE CORP., Ft. Wayne, Ind., which was organized by Geo. H. Sparling and started operation on May 1, 1938, has a plant that is of considerable interest.

It will be noticed in the illustration that aggregates are received in railroad cars on a track adjacent to the plant. This spur track, owned by the company, has a capacity for 12 cars.

The aggregates are dumped directly from the cars into a pit from which the material is picked up by two Burch portable belt conveyors, arranged in tandem, and delivered to a three-compartment Butler steel bin erected above the plant. Bin compartments have capacities of 40, 40, and 50 cu. yd. One of the conveyors, 28-ft. centers, is standing on the ground level and takes material from the pit, and the other, 45-ft. centers, is mounted at the upper end on the plant roof. Both conveyors have 24-in. belts and have a capacity of 3 tons per minute. Aggregate is deflected to any desired bin compartment by a baffle board mounted on an A-frame over the bins. The conveyor is also available for unloading bagged cement from cars.

Geo. H. Sparling standing in front of one of his transit mixer trucks

Six Rex truck mixers are operated, four of 1½ cu. yd. and two of 2½ cu. yd. capacity, mounted on two Indiana and four International trucks.

In addition to the permanent ready-mixed concrete batch plant, a portable unit is available for road and bridge work. Mr. Sparling was formerly a road contractor and grader.

Brick Concern Now Makes Concrete Products

POSTON-SPRINGFIELD BRICK CO., Springfield, Ill., brick manufacturer for 50 years, has installed modern machinery to make concrete block, lightweight units and miscellaneous concrete products including sills, coping, etc. Emmett V. Poston is president of the company and Austin N. Reece is secretary-treasurer.

Left: Aggregate is dumped directly from cars into pit from which it is elevated to plant bins by two portable conveyors operating in tandem. Right: Showing smaller conveyor to the left and larger conveyor supported on the roof of ready-mixed concrete plant

One-Man Batching Plant

(Continued from page 71)

The subcontract approach to this problem has been made more imperative by the practice of selling mixed concrete of a specified minimum strength. On the average job, the free standing time of 20 min. has proved to be adequate and mutually protective as between the customer and the operator. Based on this premise, Graham Bros., Inc., now quote all small jobs on a per cu. yd. delivered basis, including a free standing time of 20 min. For any reduction from the 20-min. period, the customer receives a credit computed on a rate of $2.50 per hr., and for an excess of time a charge based on a rate of $2.00 per hr. Many large jobs also are sold on this basis. On those involving large yardages, the policy is to base credits and charges at the same hourly rates. These are computed on the total saving or loss of time on the job as a whole, rather than on the individual loads. This procedure has proved workable and is supported by the more efficient contractors in this market.

Each delivery ticket carries the weight certificate of ingredients, time of loading, time of arrival at job, start of unloading, and completion of loading. These last three are filled in on the job and can be checked by the purchaser's representative. If only a reasonable period elapses between arrival at the job and start of unloading, the unloading time entries represent the period from the time concrete is first discharged until the entire load is unloaded.

Sales of ready-mixed concrete have steadily increased over a 10-year period, and at present keep 17 trucks busy. The main batching plant used exclusively for truck mixers is located in the industrial district of Vernon, Calif. Charging facilities also are available at the Rancho plant in San Fernando valley, the El Monte plant in the San Gabriel valley, the Orange County plant, and at Long Beach. Four belt conveyor transfer rigs are used to charge truck mixers when servicing jobs at some distance from rock and sand production.

New Concrete Brick Company in N. Y.

GRAVEL PRODUCTS CORP., First St. and the Niagara river, Tonawanda, N. Y., recently celebrated the formal opening of its new concrete brick factory with a dinner at which builders, newspaper men, and others were invited guests. The new plant will start operating on an eight-hour shift, employing a maximum of 10 men.

To Make Lightweight Slag Block

ALEX GUIGOU has established a concrete block manufacturing plant in Valdese, N. C., and plans are under way to use a lightweight slag aggregate. Mr. Guigou recently moved from Tennessee to his new location. It is reported that the plant in Valdese will be an agency for the Republic Steel Co.

Purchases Burial Vault Business

ROLLO FRAME, Columbus, Ohio, has purchased the concrete burial vault business of Quinn and McCann at Kenton and has moved his family to Kenton. Mr. Frame has been employed in the testing laboratories of the Ohio State Highway Department for the past five years. He is planning to install a modern showroom in a downtown business location.

Builds New Block Plant

FABER CEMENT BLOCK CO., Paramus, near Hackensack, N. J., has built a new concrete products plant, 58 x 106 ft. in plan, and is operating a Stearns Joltcrete machine.

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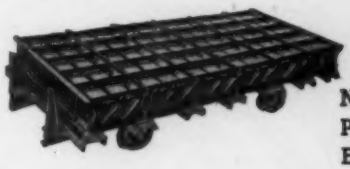
This shows one of our Multiple Molds for casting 8x8x16" concrete blocks. We manufacture a complete line of Multiple Molds for blocks (both Rockface and plain), for brick, veneer blocks, etc. We are also owner and originator of the ZAGELMEYER SYSTEM of granite veneer for blocks.



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Waterproof Concrete Blocks

No Other System Produces a Block Equal to This!

A Start May Be Made With as Little as $500.00

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601 S. HENRY ST. BAY CITY, MICH.

NEWS of the month

Optimistic Outlook for 1939

PACIFIC PORTLAND CEMENT CO., San Francisco, Calif., is anticipating a fair business year, according to comments of J. A. McCarthy, vice-president and general manager, before a stockholders' meeting. The month of October, 1938, was the company's best business month of the year, and November and December business were running ahead of comparable 1937 periods. At the time of the meeting, late in December, unfilled orders on hand totalled 282,000 bbl. of cement, compared with 189,000 bbl. a year ago.

According to Mr. McCarthy, the current year should be as profitable to the company as 1937 was, in view of anticipated increases in residential and slum-clearance building and with an indicated 600,000 bbl. to 650,000 bbl. of cement to be used for the Central Valley project. The company's net profit, for 1937, amounted to $401,646, or $6.61 a share on 60,613 shares of $6.50 preferred stock outstanding at the end of the year.

To Build New Gravel Plant

ROCK ISLAND SAND AND GRAVEL CO., Rock Island, Ill., has purchased a 75-acre gravel deposit west of Milan on which it is planned to erect a modern washing and screening plant. The cost of the plant will be between $30,000 and $40,000. Work on the new plant will be started in the near future, according to H. J. Larkin, secretary, and it is hoped to be ready for production by late spring. The present plant will be maintained, but will be operated on a reduced scale. Purchase of the new tract was made necessary by the depletion of the present gravel deposit.

Lehigh Pushes Construction at Alsen, N. Y.

LEHIGH PORTLAND CEMENT CO. is progressing rapidly with the rehabilitation of its Alsen, N. Y., plant, according to reports. If weather conditions permit, work will be continued throughout the winter. Twenty new silos have been built by the Fairmont Construction Co. and buildings are now being renovated before the installation of new machinery. All, or most, of 1939 will be required to complete the entire project.

Large Railroad Ballast Program

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD has announced a track ballasting program for 1939 which contemplates the placing of 680,000 cu. yd. of track ballast. This program is contingent upon improved business conditions, and it will not be definitely determined whether the plans will be carried out in entirety before early in the summer. No information has been released as to the sections of track which will be ballasted. However, the largest percentage of ballast heretofore used has been gravel, but chats from the zinc mining areas, cinders and other materials also have been purchased in small quantities.

Dredge Operators Seek Extension of U. S. Permits

SEVERAL SAND AND GRAVEL DREDGE OPERATORS have sought extensions of their permits from the federal government. The Sangravel Co., Inc., Nashville, Tenn., has applied to the War Department for a three-year extension of its dredging permit which expired December 31, 1938. This permit covers dredging of sand and gravel in the Tennessee river from its mouth at Livingston Point, 2.3 miles above Paducah, to Riverton Lock, Ala., the material to be placed ashore for commercial purposes.

THE TENNESSEE VALLEY SAND AND GRAVEL CO., Sheffield, Ala., has applied for a similar three-year extension of its dredging permit, covering operations in the Tennessee river from the foot of Big Sandy Island to the head of White Oak Island, from Smithsonia Landing to Sheffield Landing, and from a point ½ mile below the mouth of South Chickamauga Creek to the mouth of Harrison Branch.

THOMPSON-BROWN SAND CO., Nolan, W. Va., also has applied for an extension of its dredging permit for recovery of sand and gravel from Tug Fork of Big Sandy river between Kermit and Williamson, W. Va., from mile 35 to mile 57 above the mouth of the fork.

MISSOURI RIVER SAND & GRAVEL CO., Boonville, Mo., has requested an extension of three years on its War Department permit to dredge the Missouri river in the vicinity of Boonville, Mo., extending from Mile 211.4 to Mile 203.4 above the mouth. The original permit was issued to this company on April 17, 1929, and it has been renewed for three-year periods since that date.

Activities In the Phosphate Industry

TENNESSEE phosphate shipments slowed up somewhat in the first half of January, 1939, except for TVA requirements and intermittent farmer shipments for direct application. Mining operations, however, are proceeding steadily preparing material for later shipment and supplying crude run of mines product for the Monsanto Chemical Co., and the mining company producing sintered product for the Victor Chemical Co. Much of this material is being mined by small dragline shovels and transported by truck for distances varying from 5 to 15 miles.

With an estimated consumption of 100,000 tons per annum, it would seem that TVA is supplied with rock for 100 years. Under this condition, even so far-seeing an operation as TVA is planned to be might not need to be in a hurry to make additional expenditures in developing western desposits.

Robert M. Cooper, general manager of the federal Santee-Cooper power project near Charleston, S. C., said that with the completion of this development, making possible a cheap source of power, a revival of the South Carolina phosphate industry may be expected.

Improvements Being Made in Middle West Gravel Plants

IMPROVEMENTS are now being carried out at a number of sand and gravel plants in the Middle West, following a busy season in 1938. Typical of these improvements is the announcement that the Wergin Sand & Gravel Co., Antigo, Wis., plans to double its capacity for anticipated larger demands in 1939.

Wilkey Gravel and Sand Co., Portageville, Mo., has installed a 75-hp. Diesel engine and pump on a barge.

Ideal Sand and Gravel Co., Mason City, Iowa, is reported to be making several improvements, including the construction of timber bunkers having a capacity of 300 tons, divided into four compartments.

California Gravel Plant Activities

HUBBS BUILDING MATERIALS CO., Colton, Calif., has received a permit to erect a gravel plant at the corner of Eighth and Johnson streets. The plant will cost $7,000.

FRANK B. MARKS, SR., who owns the gravel pit at Newman, Calif., and at two other locations in the state, has been awarded a contract to furnish 50,000 tons of gravel to be used in resurfacing the road between Alder Creek and Wawona. Equipment to be used will be transferred from his Newman and Los Banos plants.

Talc Industry Growing in North Carolina

PYROPHYLLITE TALC PRODUCTS, INC., one of the six concerns producing talc in North Carolina, has established executive offices at Mount Airy, N. C. The talc industry is looking up in the state and the plants expect to operate at full capacity during 1939. The product has a variety of uses and research conducted in the fields of plastics, refractory cements and paints will likely develop more outlets.

WPA Labor in Commercial Quarry

INDEPENDENT GRAVEL CO., Joplin, Mo., has a contract with the city of Carthage, Mo., by which it does part of the work, and WPA labor the rest, of producing crushed stone from its Carthage quarry for use in a WPA city-wide street improvement program. By the terms of the contract, the gravel company drills and shoots the stone, and crushes it, after WPA workers have sledged it to 8-in. size, at a charge of 60c per ton.

To Build Rock Wool Plant

M. E. CALLANDAR, Dallas, Texas, is planning to build a rock wool plant at Easley, near Ashland, Mo. Limestone outcropping from the Missouri river bluffs will be used for the principal raw material.

Purchases Quarry Land

CALLANAN ROAD IMPROVEMENT CO., South Bethlehem, N. Y., has taken title to land at Mingo Hollow, N. Y., where it had been crushing stone for a year. The quarry had been operated under a lease with option to purchase.

Feldspar Quarry Is Busy

OLD DOMINION MINERAL CO. is operating day and night quarrying feldspar in the Lowesville section of Amherst county, Virginia.

Potomac's Golden Sands Make Front Page

THE WASHINGTON POST rotogravure section dated January 8th had a full page of pictures with captions describing the sand dredging operations on the Potomac river near Washington, D. C. During 1937 more than 884,000 tons of sand and 695,000 tons of gravel were taken from the river.

Quarry Obtains Fuel On Its Own Property

NEON STONE QUARRY, near Lima, Ohio, literally takes its source of power out of the ground. The former owner of the quarry had 12 producing oil wells on the property, and when the present owner took over operation it was decided to restore one of the oil wells next to plant, which is shown in the airplane view. From this well, natural gas is obtained which in turn is used to operate a Fordson tractor that drives the oil well pump. About 150 gal. of crude oil are pumped daily, one-third of the production being used as fuel to drive a 125 hp. Buckeye Diesel engine for plant power purposes. The remainder of the crude oil is sold for about $2 per bbl. This brings the power costs practically down to zero.

Equipment operated by this plant includes: a McCully No. 5 crusher, two Allis-Chalmers No. 2 and No. 3 crushers; a rotary screen 40 in. x 18 ft.; a 6-in. Fairbanks-Morse centrifugal pump, wagon well drills, and an Osgood steam shovel. Plant capacity is 200 tons daily.

James A. Howenstine, president of the company, is secretary-treasurer of Neon Products, Inc., manufacturing neon signs, from which the quarry takes its name. Mr. Howenstine is an airplane enthusiast and flies his own plane. He is also an amateur photographer of ability, the photographic illustration of the plant shown herewith having been taken from his plane. The tractor, previously mentioned, is shown in the center foreground of the illustration.

Airplane view of the Neon Stone Quarry showing oil well near crushing and screening plant. Natural gas and oil from well furnishes fuel for all power purposes

FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

Canada Cement Co., Ltd., pfd.	$1.25	Mar. 20
Lehigh Portland Cem.	.25	Feb. 1
Lehigh Portland Cem., pfd.	1.00	Apr. 1
Missouri Portland Cem.	.25	Dec. 20
Signal Mountain Portland Cem., pfd.	8.00	
Accumulation of unpaid pfd. dividends during several years prior to 1935.		

CANADA CEMENT CO., LTD., Montreal, Que., reports net earnings for the fiscal year ending November 30, 1938, amounted to $1,124,511.65 after providing for depreciation and making provision for Provincial and Dominion income taxes. This compares with $1,477,831.47 in the previous year. Net working capital shows a decline of $314,685.19. This decline in working capital, however, is more than accounted for by the fact that the holdings of the company's own bonds increased from $16,915 in 1937 to $557,000 in 1938. Short-term serial bonds retired during the year amounted to $750,000. The mortgage on the Canada Cement Building was reduced by $50,000.

Capital expenditures made during the year included the installation of coal pulverizers and the improvement of packing facilities. President J. D. Johnson, in his report, states, "The outlook for the coming year is more promising. If present prospects materialize, there should be a better volume of business for your company during 1939." While sales of cement have not been as great in the past 12 months as in the previous year, the total will only be about 5 percent less than in the 1937 fiscal year. Government business was somewhat restricted but other business held up well.

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PACIFIC PORTLAND CEMENT CO., San Francisco, Calif., held a stockholders' meeting on December 19, at which the proposed reorganization plan was rejected. This plan was given in detail in ROCK PRODUCTS for January, 1939, p. 98. The vote was in favor of an alternative resolution offered by John D. McKee, vice-president and director, for appointment of a stockholders' committee to study the company's situation and report back with a plan for reorganization on February 6.

John A. Mc Carthy, vice-president and general manager of the company, reported at the meeting that October had been the company's best business month in 1938, and that November and December business had run ahead of comparable 1937 periods.

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SUPERIOR PORTLAND CEMENT, INC., Seattle, Wash., reports for the year ended December 31, 1938, a net profit of $257,661 after depreciation, depletion, federal income taxes, etc., equal after payment of $3.30 a share on the 75,240 shares of participating Class A stock to nine cents a share on 100,000 no-par shares of Class B stock. This compares with net profit in 1937 of $428,363, equal under the participating provisions of the shares, to $3.47 a share on 75,240 shares of $3.30 Class A stock and $1.67 a share on 100,000 shares of Class B stock. Current assets as of December 31, 1938 including $469,137 cash, amounted tc $1,644,097 and current liabilities were $309,109. This compares with cash of $540,638, current assets of $1,566,511, and current liabilities of $248,861 on December 31, 1937.

Stockholders were advised that this reduction in earnings was largely due to curtailment of cement shipments to Grand Coulee dam. Prospects for increased construction activity plus resumption of Coulee shipments and the start of work on the Lake Washington bridge and approaches at Seattle are expected to lift the operating level for 1939 substantially.

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YOSEMITE PORTLAND CEMENT CORP., Merced, Calif., has advised regulatory authorities that 256,387 shares of preferred, 4,126½ shares of class A common and scrip certificates calling for 374.2 shares of preferred stock were outstanding as of October 31, last. The company also announced that 2,787 shares of preferred stock had been canceled and returned to the status of authorized but unissued stock. Capitalization of the company at the end of last month represents a conversion to common stock of 98.14% of the 221,451 shares of class A common stock outstanding prior to adoption late in 1936 of a recapitalization plan.

Conversion of the 4,126½ remaining shares of class A common stock into new preferred stock, at the rate of an even exchange plus one-quarter share preferred for each $10 in accumulated dividends on the class A stock, may be made until December 31, next, the date to which directors have extended the conversion privilege. No commitment has been made on further extensions.

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ADVANCE CAST STONE, Milwaukee, Wis., has filed notice of a change in its incorporation certificate, increasing the number of shares from 120 at $100 par to 240 shares no par value. It also increased the number of directors from three to four, and made some minor changes in the purposes of the company.

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NORTHWESTERN STATES PORTLAND CEMENT CO., Mason City, Iowa, at its annual meeting announced through President Hanford MacNider that while the cement industry in general showed a decline in business of nearly 10 percent, the company's decline was considerably less than this figure. The management reported it had every reason to believe the first part of the coming year should reflect the better sentiment that is apparent. On December 20, 1938 the company was continuing oprations and it was believed only a short shut-down would be necessary for repairs.

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NEW HAVEN TRAP ROCK CO., New Haven, Conn., as of November 30, 1938, reports total assets of $3,373,431 as compared with $3,371,915 for the same date in 1937. Plants and property amounted to $3,003,836 as compared with $2,975,983 in 1937. Crushed stone was valued at $67,873 on November 30, 1938 as against $85,167 for the same date in 1937.

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NATIONAL GYPSUM CO., Buffalo, N. Y., has received notice that the New York Stock Exchange has approved the initial listing of the company's 60,000 shares of $4.50 cumulative convertible no par preferred stock, which are issued and outstanding.

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BARNSDALL TRIPOLI CORP., Seneca, Okla., is building a $100,000 plant on the Missouri-Oklahoma line east of Miami, Okla. The new unit, which will be an all-steel structure 93- x 112-ft., will require a crusher, tube mill, drier and screens.

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LONG VALLEY ORE CO., Morristown, N. Y., has under consideration the expansion of its graphite reduction plant, according to Vaughn Morrell, vice-president and manager.

Prices Bid-Contracts Let

JACKSON, MISS.: Mississippi Highway Commission has recently opened bids on paving projects involving approximately $2,500,000, which will involve large tonnages of aggregate.

DALLAS, TEXAS: The city council has awarded a contract to the Dallas Lime Co., Dallas, for 1600 tons of lime at $7.49 per ton.

CINCINNATI, OHIO: Richter Concrete Corp. has been awarded a contract by the city for 2755 cu. yd. of ready-mixed concrete at $5.76 per cu. yd. A contract was let to Sackrete, Inc., for 11,050 sacks of pre-mixed concrete at 37.3c per sack.

ARCANUM, OHIO: Bowsman Washed Sand and Gravel Co., Troy, Ohio, was low bidder for a 10.4 mile widening and resurfacing project on State route 71. The bid was $126,460, asphaltic concrete being specified.

WASHINGTON, D. C.: Coplay Cement Manufacturing Co., Coplay, Penn., has been awarded a contract for $49,000 under provisions of the Public Contracts Act. The cement is to be used for construction at the Panama Canal.

DALLAS, TEXAS: Lucas Quarries, Milsap, Texas, submitted a low bid of $4.35 per ton for 500 tons of sandstone to be used in riprap work at White Rock Lake in Dallas.

NEWTON, IOWA: Jasper farmers purchased a total of 1352 tons of agricultural limestone last fall from quarries at LeGrand and Pella through facilities provided by the county board of supervisors. The cost was $1.41 to $1.89 per ton dependent upon the length of haul.

LITTLE ROCK, ARK.: Little Rock Stone Products Co. was reported low bidder for 7500 tons of rip-rap stone at 70c a ton for federal work on the banks of the Arkansas river in North Little Rock.

BLOOMFIELD, IOWA: Douds Stone Co., Douds, submitted the low bid of $2.11 per cu. yd. for surfacing secondary roads in Davis county. The bid price included the hauling of crushed stone.

BLUFFON, IND.: County commissioners have awarded contracts for 27,000 cu. yd. of gravel for the year 1939 to John Dehner and S. and L. Gravel Co., Marion, Ind., for $16,842. The price ranged from 50c to 70c per cu. yd., depending on location of the pits.

ALEXANDRIA, IND.: County commissioners of Madison county awarded contracts for 3500 cu. yd. washed screened gravel and pea size gravel to Western Sand and Gravel Co., and Myers Sand and Gravel Co., at prices from 60c to $1.35 per cu. yd. S. and L. Gravel Co, Marion, Ind., was awarded a contract for 50,000 cu. yd. of dipped and screened gravel from nearby pits at 75c per cu. yd.

FAIRFIELD, IOWA: The county has established a set rate of $1.04 per ton at the quarry for agricultural limestone and road material. A charge of 25c per ton is to be charged for hauling up to five miles, with a sliding scale for distances over five miles.

SARDIS, MISS.: U. S. Engineers' Office, Vicksburg, has let a contract to the J. L. Shiely Co., St. Paul, Minn., to furnish and deliver approximately 175,000 cu. yd. of stone at $1.35 per cu. yd. for dumped rip-rap. The material is for construction at Sardis dam, delivery f.o.b. cars contractor's shipping point, Bangor, Ala.

JACKSON, MISS., Cheney Lime & Cement Co., Birmingham, Ala., has been awarded a contract by the City of Jackson for an estimated 150 tons of hydrated chemical lime at $11.29 per ton in 50 lb. paper bags, in C/L lots f.o.b., Jackson, subject to a cash discount of 25c per ton for payment on the tenth of the month following shipment.

Gravel Plant Owner Awarded Bridge Contract

G. L. TARLTON, head of Contractor, Inc., Pacific, Mo., owner of two gravel plants, was awarded a contract for construction of a $6,428,209 bridge across the Mississippi river from National City, Ill., to Broadway between Florida and Mullanphy streets in St. Louis. The gravel plants owned by this company are the Consumers' Sand and Gravel Co., and the Missouri-Illinois Material Co., both of Pacific, Mo.

AN APPROPRIATION of $40,000 has been made by the Dane County (Wisconsin) Board for a WPA gravel crushing project which is expected to provide work for 600 men during the winter months. The WPA gravel crushing program is part of a blanket state project for improvement of farm-to-market roads.

ARKHOLA SAND AND GRAVEL CO., Ft. Smith, Ark., has opened an office and plant at 319 Scott St., Fayetteville, Ark. This company has been active in establishing ready-mixed concrete plants in Arkansas and Oklahoma. W. S. Dills is manager and William James is foreman.

THE NEWARK SAND CO., Newark, N. J., has been ordered to appear before the court to show cause why a receiver should not be appointed. The suit which was brought by a creditor charged that the company had become insolvent.

Made of Acid Open Hearth Steel Wire

Round Strand
Flattened Strand
Preformed
Steel Clad
Non-Rotating

The Service Record of this wire rope continues to make and hold friends.

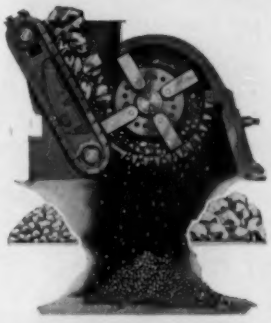
MADE ONLY BY

A. LESCHEN & SONS ROPE CO.
Established 1857

5909 Kennerly Avenue St. Louis, Mo.

New York — Chicago — Denver
San Francisco — Portland — Seattle

A New High Degree of Crushing Efficiency



More production—more profit—lower operating and maintenance costs. All these are features of DIXIE performance.

Simple in design, yet sturdy in construction, DIXIE NON-CLOG and Regular Stationary Breakers are unexcelled for primary, secondary or fine reduction. Note particularly the continually moving breaker plate which means that DIXIE Hammermills will outlast and out-perform any other type.

Write for complete details on DIXIE'S 40 sizes.

DIXIE MACHINERY MFG. CO.

4109 Goodfellow Ave. ST. LOUIS, MO.

STARTING THE YEAR RIGHT WITH A

UNIVERSAL

A good start is half the battle. With UNIVERSALS turning out perfect screening jobs on your most difficult separations you can look forward to a profitable year. Sturdily built of the finest materials, they will stay right on the job for you, yet their prices are surprisingly low. Let us send you our 32-page catalog today.

A copy is yours for the asking.

UNIVERSAL VIBRATING SCREEN CO.
RACINE - - WISCONSIN

Mill Shutdowns for Repairs and Modernization

The following plants have announced shutdowns with bins full, and shipments are continuing from stock.

LONE STAR CEMENT CORP., Spocarl, Ala., plant discontinued production in December, 1938, with a large accumulation of stock.

LEHIGH PORTLAND CEMENT CO., Iola, Kan., plant has been shut down for the winter months. The mill had one of its best years in 1938, operating all but six weeks during the summer, according to reports. The Mason City, Iowa, plant is shut down until about March 1.

PENNSYLVANIA-DIXIE CEMENT CORP., Clinchfield, Ga., plant stopped operations on January 1 and expects to start the kilns again about February 15.

MARQUETTE CEMENT MANUFACTURING CO., Cape Girardeau, Mo., plant stopped production after the holidays for a short time to make repairs and alterations.

LAWRENCE PORTLAND CEMENT CO., Northampton, Penn., plant resumed operations in January after a shutdown of six weeks.

LONE STAR CEMENT CORP., Hudson, N. Y., plant is reported to have shut down in January for the seasonal period for repairs.

What a difference Naylor's exclusive Lockseam Spiralweld Structure makes! That's why no other light weight pipe can give you the same results. First in the field, Naylor Pipe stands unequalled in service to industry. Sizes 4" to 30" in diameter with all types of fittings and connections. Write for catalog No. 37.

NAYLOR PIPE COMPANY
1237 EAST NINETY SECOND ST.
CHICAGO, ILLINOIS

One SLY UNIT FILTER SOLVES DUST PROBLEM

AT THREE POINTS IN ROCK CRUSHING PLANT

CASE NO. 3

* The data for this series of advertisements describing actual dust control installations in crushed stone plants is taken from our files. The advertisements are presented to help you conform to insurance regulations, state and local laws, and to improve working conditions. They explain how one Sly Unit Filter effectively and economically controls several sources of dust at one time.
SLY

You, too, may be faced with an emergency as was the owner of a new rock crushing plant in New York. Due to the insistance of the state inspector, a remedy for the dust had to be found immediately—and inexpensively.

Dust occurred at three points:

(1) Where feeder belt conveyor emptied rock into jaw crusher
(2) Where jaw crusher discharged into boot of bucket elevator
(3) Where bucket elevator discharged onto belt conveyor carrying rock to bins

The solution was a No. 34 Sly Unit Filter with suitable hoods and enclosures—a 5" exhaust pipe to (1) a 7" pipe to (2) and a 4" pipe to (3)—*with the filter located only 34' from this third point, the longest connection.* Very little piping was required; a 5 H.P. motor was sufficient for operation of fan.

The filter offered an unusually large amount of filtering capacity for the small amount of space occupied and cost, exclusive of piping, only $807. The cost of equipment and operation thus added but slightly to the cost of production and solved the problem immediately and inexpensively.

Ask for Bulletin R-90.

THE W. W. SLY MANUFACTURING COMPANY
4746 Train Avenue Cleveland, Ohio
BRANCH OFFICES IN PRINCIPAL CITIES

BLAST CLEANING EQUIPMENT SLY TUMBLING MILLS
DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

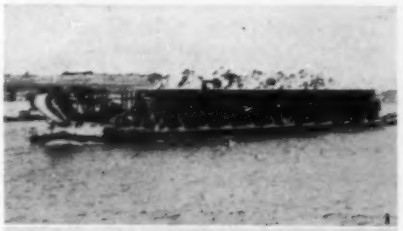
World's Only Self-Unloading Rip-Rap Barge

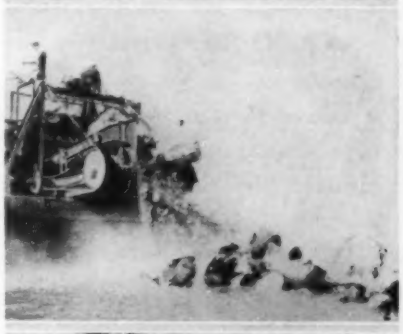
THE PICTURES herewith show what is believed to be the only self-unloading barge for handling rip-rap stone in the world. It was designed and built by A. G. Streblow and his associates in the Basalt Rock Co., Napa, Calif., and is being used to transport and place rip-rap for a government job in San Francisco Bay.

The hull is all steel, welded, and the load is carried in a deck hopper, holding approximately 600 cu. yd. It was fabricated by the rock company with its own workmen. Through the center of the hopper runs a conveyor belt which extends beyond the stern or end of the scow, or barge, and is driven by electric power from a gasoline engine generator set. The power so generated is used also for various hoists and other operating mechanism.

The secret of the barge lies in the method of discharging the rip-rap cargo to the belt conveyor. The hopper is so constructed and controlled that the rock slips down on to the belt in narrow panels (one at a time) the length of the barge. Naturally, if the entire cargo was to descend on the belt at one time, or was originally loaded resting on the belt, it could not be moved.

Mr. Streblow is probably the first man to dare to handle rip-rap size stone on a belt conveyor. He got his idea from watching some of the big gold dredges in the Sacramento River valley. These discharge waste gravel boulders of pretty good size over the stern by means of belt conveyors. Mr. Streblow figured if belts could handle boulders that size they could be made to handle rip-rap. The problem was to feed the belt; and it took real ingenuity to beat that one.





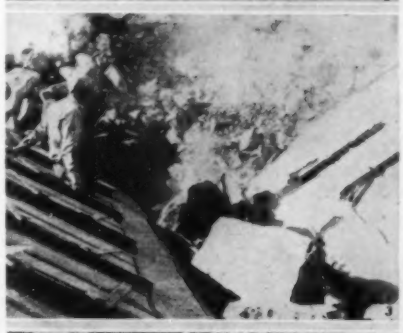


Fig. 1: World's only self-unloading rip-rap scow. Fig. 2: Belt conveyor placing rip-rap on sea wall. Figs. 3 and 4: Two views showing character of cargo and method of feeding it to conveyor

Pennsylvania Quarry Damaged by Fire

JACOB D. STRICKLER, Mount Joy, Penn., quarry operator, had a fire at his East Donegal quarry causing $10,000 damages. It is reported that three men confessed siphoning gasoline from trucks and that a match ignited the gasoline. The loss was partially covered by insurance.

Cement Concern Rewards Workers

GLENS FALLS PORTLAND CEMENT CO., Glens Falls, N. Y., at a recent dinner attended by 190 employes, awarded prizes in a safety contest conducted in the mill. The five groups numbering 141 employes all had perfect records for the last half of 1938 so the prize money was divided equally. Five other cash awards were distributed to winners of a contest for suggestions to improve working conditions in the plant. Honored guests at the dinner were three employes who had served more than 40 years with the company. They were presented with gold buttons in token of their records. This plant has the distinction of having practically no labor turnover.

DEWEY PORTLAND CEMENT CO. has awarded year-end bonuses totaling $25,000 to employes at its Dewey, Okla., and Davenport, Iowa, plants. The amount of the bonuses was proportioned according to earnings of the employes during 1938.

THANK YOU!

It is most gratifying to us, as we review last year's business to note the enthusiastic acceptance of the new screen which we introduced at the beginning of last year.

The confidence placed in our product by the aggregate producers, has more than justified our efforts to build a superior vibrating screen.

So again we say

"THANK YOU"

SCREEN EQUIPMENT CO.
2 Lafayette Ave. Buffalo, N. Y.

Builders of

SECO

The Modern Vibrating Screen

PROPORTION ACCURATELY

WITH POIDOMETERS

These efficient, accurate, economical weighing and feeding machines have proven their value to operators of cement mills, for accurately proportioning stone and clay —also clinker and gypsum by weight and not by volume.

Also being used for weighing and feeding material to all types of Grinding Mills.

The Poidometer is self-contained. The scale beam is graduated in pounds or kilos, and can be set at whatever amount of material may be required per foot of belt travel; the gate is then adjusted to suit this weight, and the machine will deliver the pre-determined amount of material with an accuracy of ninety-nine per cent.

Write for Catalog No. 2 and get complete profit-producing facts!

Schaffer Poidometer Co.
2828 Smallman St. PITTSBURGH, PA.

BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.

EARLE C. BACON, Inc.
17 John Street New York, N. Y.

Perforated
METAL SCREENS
ANY SIZE - ANY SHAPE
ANY METAL - ANY PERFORATION
H & K screens are produced to meet the most exacting specification and to serve well and long. Quality and workmanship are given first consideration.
Write for catalog!
The Harrington & King PERFORATING Co.

3650 Fillmore St., Chicago—114 Liberty St., N. Y.

Cement Mills Hang Up New Safety Record

Close of the fifteenth annual safety trophy contest by the Portland Cement Association on December 31, revealed the greatest number of winners at any time since the contest was inaugurated in 1923. Fifty-three out of 120 reporting mills completed 1938 without lost-time or more serious accident—over 43 per cent of the total. No similar record is known to exist in any American industry. Certainly nothing comparable to it has been announced in any of the heavy industries.

Winners of the 1938 award, listed in order of length of accident-free record and with years of former awards of the Portland Cement Association safety trophy, are as follows:

	Plant	Company	Superintendent	Accident-Free Years
1.	Iola, Kans.	Lehigh	C. A. Swiggett	1927 to 1928, inc.
2.	Birmingham, Ala.	Alpha	H. O. Underhill	1930, 1932 to 1938, inc.
3.	Howes Cave, N. Y.	North American	J. W. Campbell	1930, 1931, 1933 to 1938
4.	Sugar Creek, Mo.	Missouri	Otto Schulzke	1934 to 1938, inc.
5.	Exshaw, Alta.	Canada	V. C. Hamilton	1928, 1930 to 1933, inc., 1935 to 1938, inc.
6.	Louisville, Nebr.	Ash Grove	A. K. Frolich	1931 to 1933, inc., 1935 to 1938, inc.
7.	Kingsport, Tenn.	Penn-Dixie	Norman V. Geyer	1928, 1932, 1935 to 1938
8.	Wyandotte, Mich.	Michigan Alkali	H. A. Browne	1935 to 1938, inc.
9.	Hull, Que.	Canada	D. A. Gasper	1927, 1933, 1934, 1936 to 1938, inc.
10.	Manheim, W. Va.	Alpha	W. L. Matthes	1928, 1930, 1933, 1936 to 1938, inc.
11.	Ironton, O.	Alpha	F. C. Brownstead	1927 to 1932, inc., 1935, 1937, 1938
12.	York, Pa. (white)	Medusa	E. E. Whitlatch	1930 to 1935, inc., 1937, 1938
13.	Pt. Colborne, Ont.	Canada	L. M. McDonald	1925, 1930 to 1932, inc., 1935, 1937, 1938
14.	Hudson, N. Y.	Lone Star	R. G. Sutherland	1933 to 1935, inc., 1937, 1938
15.	Bellingham, Wash.	Olympic	A. F. Krabbe	1931 to 1933, inc., 1937, 1938
16.	Nazareth, Pa.	Penn-Dixie	Johan Norvig	1930, 1933, 1935, 1937, 1938
17.	Mitchell, Ind.	Lehigh	W. H. Weitknecht	1924, 1926, 1930, 1937, 1938
18.	Union Bridge, Md.	Lehigh	G. S. LaForge	1932, 1933, 1937, 1938
19.	Belleville, Ont.	Canada	J. H. Legate	1927, 1932, 1937, 1938
20.	Humboldt, Kans.	Monarch	C. P. Mitchell	1932, 1934, 1937, 1938
21.	Cowan, Tenn.	Cumberland	Luther B. Williams	1933, 1935, 1937, 1938
22.	Bamberton, B. C.	British Columbia	J. H. McIntosh	1937, 1938
23.	Dewey, Okla.	Dewey	P. R. Chamberlain	1937, 1938
24.	York, Pa. (grey)	Medusa	E. E. Whitlatch	1929, 1932 to 1936, inc., 1938
25.	Portland Point, N. Y.	Penn-Dixie	F. P. Werner	1930, 1932 to 1936, inc., 1938
26.	Duluth, Minn.	Universal Atlas	Ray S. Huey	1925, 1927, 1929, 1932 to 1934, inc., 1938
27.	Manitowoc, Wis.	Manitowoc	F. E. Town	1930 to 1934, inc., 1938
28.	Ft. Whyte, Man.	Canada	C. W. Edmonds	1926, 1930 to 1932, inc., 1934, 1938
29.	Bonner Springs, Kan.	Lone Star	W. W. Deadman	1927, 1932 to 1934, inc., 1936, 1938
30.	Clinchfield, Ga.	Penn-Dixie	E. P. Newhard	1933 to 1936, inc., 1938
31.	Birmingham, Ala.	Lehigh	R. H. McFetridge	1929 to 1931, inc., 1934, 1938
32.	Cape Girardeau, Mo.	Marquette	Robert Matthews	1928, 1929, 1934, 1935, 1938
33.	Dallas, Tex.	Trinity	J. W. Ganser	1928, 1929, 1932, 1936 1938
34.	Sandt's Eddy, Pa.	Lehigh	Jas. A. Gish	1928, 1930, 1932, 1933, 1938
35.	Valley Junction, Ia.	Penn-Dixie	R. A. Bechtold	1931, 1933, 1934, 1936, 1938
36.	New Orleans, La.	Lone Star	A. D. Stancliff	1929, 1935, 1936, 1938
37.	Oswego, Ore.	Oregon	H. R. Shipley	1928, 1932, 1936, 1938
38.	Wampum, Pa.	Medusa	A. F. Krebs	1930, 1933, 1938
39.	St. Louis, Mo.	Alpha	F. R. Loveridge	1930, 1935, 1938
40.	Oglesby, Ill.	Lehigh	J. Bassett	1931, 1933, 1938
41.	Hooker's Point, Fla.	Florida	G. D. Brown	1933, 1935, 1938
42.	Cementon, N. Y.	Alpha	Arch Brown	1930, 1938
43.	Petoskey, Mich.	Petoskey	E. C. Switzer	1930, 1938
44.	Davenport, Calif.	Santa Cruz	Joseph Riordan	1931, 1938
45.	Evansville, Pa.	Allentown	D. C. Morgan	1933, 1938
46.	Buffington, Ind.	Universal Atlas	J. H. Kempster	1934, 1938
47.	Catskill, N. Y.	North American	G. A. Witte	1935, 1938
48.	Waco, Tex.	Universal Atlas	C. A. Wallerstedt	1936, 1938
49.	Bessemer, Pa.	Bessemer	D. C. McKee	1938
50.	Egypt, Pa.	Giant	O. D. Havard	1938
51.	Ada, Okla.	Oklahoma	C. Rodarmel	1938
52.	Seattle, Wash.	Superior, Inc.	N. H. Nelson	1938
53.	W. Conshohocken, Pa.	Valley Forge	G. E. Newhard	1938

Government Competition In Sand and Gravel

COMPETITION by federal government agencies and a trend toward the same sort of competition among lesser political sub-divisions, such as counties, is heading the United States directly into socialism, said J. J. Gorman, president of Zanesville Gravel Co., operating plants at Dresden and Conesville, Ohio, addressing the Board of County Commissioners. Mr. Gorman was before the board to tender a bid for furnishing gravel in Linton township for Roads 123 and 410, now being improved through cooperation with WPA.

The meeting of the Board was a continuation of the "gravel war" that has been going on under the surface in the county for the last two months, with larger companies holding out for washed and graded gravel at higher prices and small producers insisting on bank run material to be furnished at local pits. Mr. Gorman quoted two prices to the county board for the road jobs, 25c per ton for bank run and 40c per ton for washed gravel which had been screened and all oversize material crushed. None present disputed the fact that the washed gravel was the better material, and County Engineer A. P. Alford, on a direct question, admitted that if it were possible he would rather accept that form of material for all roads. The commissioners decided, however, that gravel for the two roads in Linton township would be taken from the Porteus pit and that bank run material would be used.

Mississippi Operators Seek Lower Gravel Rate

RAILROADS have petitioned the I. C. C. for reduced rates on sand and gravel and related articles between Jackson and other points in southern territory in order to meet the competition of wayside pits. According to the report, the sand and gravel pits near Jackson, Miss., meet competition from wayside pits nearer the location of projects for which the Jackson producers are competing. The lower rates would apply to sand, gravel, crushed stone, broken stone, limestone, crushed marble and other similar products in straight or mixed carload shipments.

Oklahoma Completes Large Highway Program

OKLAHOMA highway improvement program involved 526 miles of road and the construction of 99 bridges during 1938. Improvements during the year included 52.3 miles of concrete highway, 11.7 miles of gravel surfacing, 30 miles of asphalt, and 156.8 miles of oil mat. The highway department concentrated on federal aid projects during the year due to the deficit and the necessity of matching federal aid.

Suit for Wages

TROY TRAP ROCK CORP., Troy, N. Y., has been sued by a group of former employes who claim the corporation had not paid wages to them. The company operates a quarry near Cropseyville, N. Y.

Building New Slurry Tanks

THE WASHINGTON-IDAHO LIME PRODUCTS CO., Spokane, Wash., is building five new slurry tanks at its Orofino, Idaho cement plant, according to Otto C. Frei, vice-president and manager. Each tank of reinforced concrete will have a capacity of 39,750 gal. The new tanks replace smaller steel tanks.

South Dakota Cement Mill Financing

SOUTH DAKOTA state-owned cement plant has paid $100,000 into its interest and sinking fund, making a total of $250,000 during 1938. The fund, now comprising about $2,130,000, has been set aside for the retirement of the $2,000,000 bond issue floated to finance the plant. These figures were announced by Julius Sieler, secretary of the state cement plant commission.

MISSOURI PORTLAND CEMENT CO. has leased additional, air-conditioned space in the Bryant building, Kansas City, Mo.

STURTEVANT

AIR SEPARATORS

243 STURTEVANTS sold on approval for Cement. Not one rejected.

"HIGH EARLY" and regular cement 1500-3300 S.S. Area.

Engineered Installations for raw or clinker show 25 to 100% capacity increase.

STURTEVANT MILL COMPANY

HARRISON SQUARE

BOSTON, MASS.

Sand-Lime Brick Production and Shipments

NINE active sand-lime brick plants reporting for December and nine for November, statistics for which were published in December.

Average Price for December

	Plant Price	Delivered Price
Grand Rapids, Mich.	$11.00	$14.00
Milwaukee, Wis.	10.00	12.50
Mishawaka, Ind.	10.50	....
Saginaw, Mich.	11.00	....
St. Louis Park, Minn.	10.00	11.50
Syracuse, N. Y.	14.00	16.00 C/L 20.00 L/C

Statistics for November and December

	November†	December‡
Production	2,555,455	2,147,860
Shipment (rail)	236,000	243,000
Shipment (truck)	2,128,502	1,922,822
Stock on hand	1,357,822	1,036,230
Unfilled orders	180,000	245,000

†Nine plants reporting: incomplete, three not reporting stock on hand and six not reporting unfilled orders.

‡Nine plants reporting: incomplete, three not reporting stock on hand and five not reporting unfilled orders.

To Build New Lime Plant In the South

ATLANTIC LIME CORP. has been organized and is now planning to build a new lime plant at Holly Hill, S. C., near Charleston. It is the plan of the company to utilize or sell the waste gases from the lime kilns for the manufacture of certain by-products, such as, liquid carbon dioxide and dry ice. The plan is to construct the plant in two units, one to be started in March for the production of agricultural lime. J. Innis McCants, president and treasurer of the company, has been connected with the cement industry. For 12 years he was with J. Ross Hanahan, Charleston, S. C., as sales manager of the old Standard Portland Cement Co., Birmingham, Ala. More recently he has been connected with the International Paper Co. The new plant eventually is expected to supply a large part of the chemical lime requirements of the paper industry in the South.

California Gravel Plant Enlarged

GRAHAM BROTHERS, INC., Los Angeles, Calif., has announced that the new $250,000 sand and gravel plant near El Monte, Calif., will soon be completed. The new unit will have a capacity of 400 tons per hr., as compared with a capacity of 100 tons per hr. for the former plant. It is an all-steel and concrete structure located on a 220-acre site having what is believed to be a very excellent deposit. Officers and directors are: Paul C. Graham, president, general manager and chairman of the board; Carder Livingston and H. F. G. Pelsue, vice-presidents; W. M. Cook, secretary-treasurer; Llewellyn Bixby, C. C. Lewis, and Russell C. Graham, directors.

Resume Cement Operations

UNIVERSAL ATLAS CEMENT CO. resumed operations at the Hudson, N. Y., on February 1 with the employment of 300 men. Richard A. Dittmar, superintendent, pointed out that the company is reopening the plant earlier than in other years. It is anticipated that the plant will keep running the balance of the year.

MARQUETTE CEMENT MANUFACTURING CO. has started up operations at its Cape Girardeau, Mo., plant, following a two-weeks period of shutdown for repair work. Repairs involved principally the power plant and the mill.

Concrete Pipe Meeting In San Francisco

AMERICAN CONCRETE PIPE ASSOCIATION, Chicago, Ill., will hold its annual convention at the St. Francis Hotel, San Francisco, Calif., February 23 to 25, inclusive.

J. W. PINCKARD, Troy, Ala., burial vault manufacturer, has purchased the Ramage Marble Works. The new firm will be known as the J. W. Pinckard Marble Works.

SELF BRICK CO., Bassett, Va., is the name of a new concrete brick concern in which T. H. Self and T. C. Self are partners. Machinery has a capacity of 1800 brick per hr. A temporary slackline cableway scraper is used to take sand from the Smith river for use in manufacturing the concrete brick.

POTTER CONCRETE CO., Cincinnati, Ohio, has purchased a new Besser fully automatic block machine.

★ MANGANESE STEEL CASTINGS ★

for CRUSHERS PULVERIZERS ROLLS SCREENS

for SHOVELS DREDGES CRANES CONVEYORS

The Frog, Switch & Mfg. Co.

Established 1881 CARLISLE, PA.

Cement Concerns Award Bonuses

LONE STAR CEMENT CORP., has distributed bonuses to employes of the Hudson, N. Y., and Bonner Springs, Kan., plants. The awards were the equivalent of two weeks' salary and were presented to employes who had been with the corporation a year or more. The bonus system of expressing appreciation for the service rendered by employes was instituted by Lone Star several years ago.

Cement Firm Re-Elects Officers

NORTHWESTERN STATES PORTLAND CEMENT CO., Mason City, Iowa, re-elected all officers and directors at the annual meeting of the organization. Earnings and shipments in 1938 did not equal those for 1937, but the management reported a successful year and favorable comparisons with the records made by the remainder of the industry.

Trends As Evidenced By Purchases

SOUTHWEST STONE CO., Dallas, Texas, is now operating several new Model RP-10 Phoenix-Easton semi-trailers at Chico, Texas.

NEW YORK TRAP ROCK CORP., New York, N. Y., has been using the model TR-10 Phoenix-Easton semi-trailer at its Haverstraw, N. Y., plant. The TR-10 is similar to the RP-10 model.

A FRENCH CEMENT COMPANY, S. A. Des Chaux & Ciments de Lafarge & du Teil has placed two orders for RP-10 model semi-trailers which are mounted on truck-tractors of United States manufacture.

To Build Bauxite Plant

AMERICAN CYANAMID AND CHEMICAL CORP., New York, N. Y., is planning construction of a new plant for processing bauxite ore at Little Rock, Ark. The cost is reported at over $100,000 and the Porocel Corp., a subsidiary, will operate it.

Fire Strikes Twice

MASSACHUSETTS BROKEN STONE CO., Waltham, Mass., had $2,500 damages at its plant recently when hot asphalt became ignited. Several months ago the company's power plant had been destroyed by fire with considerable damage to the Diesel engines.

Leases Slate Quarry

MARYLAND SLATE CORP., Silver Springs, Md., has leased and intends to operate a quarry near the Montgomery county line.

Big News!

SMALL DIESEL-ELECTRIC LOCOMOTIVES

at the lowest prices in diesel-electric history!

We have complete facilities for building locomotives. This view of the assembly floor at our Erie (Pa.) Works shows part of an order for ten 100-ton diesel-electrics for railroad use

This new 20-ton diesel-electric is one of five now working in the quarries of a large cement company

SIZES as small as 10 tons. Prices approximately the same as you pay for straight mechanical locomotives.

Here's what electric drive gives you: Smooth and constant application of power; accurate control; faster pick-up, which means more work in less time; ease of control, which keeps your operators alert.

Because of much lower operating cost, diesel-electrics pay for themselves in only a year or two. A G-E representative will analyze your haulage problem and determine how much these new diesel-electrics will save you. Write for Bulletin GEA-3071, General Electric, Schenectady, N. Y.

BUILDER OF ELECTRIC LOCOMOTIVES SINCE 1887

GENERAL ELECTRIC

250-36M

Traffic and Transportation

PROPOSED RATE CHANGES—The following are the latest proposed changes in freight rates up to and including the week of January 14:

Central

56494. Establish on **lime**, common, hydrated, quick or slaked, C. L., Detroit, Mich., to Cincinnati, O., 17c, min. wt. 30,000 lb. and 14c, min. wt. 50,000 lb.

56498. Establish on **core sand**, C. L., from the so-called Vassar Group, viz.: Vassar, Wampson, McHale and Juniata, Mich., to St. Louis, Mo., 352c per net ton in closed and open top cars.

56515. Establish on **limestone**, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb., Ridgeville, Ind., to Toledo, O., 176c and Detroit, Mich., 204c per net ton.

56520. Cancel rates on (a) **sand**, in open top car equipment (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), or gravel in open top car equipment, C. L., from Harbor Bridge, Penn., to destinations on B. & O. R. R. as shown in Items 1100 to 1138 incl., of C. F. A. L. Trf. 575, and (b) **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) in open top equipment, and **gravel**, in all kinds of equipment, from Harbor Bridge, Penn., to destinations in C. F. A. and T. L.-Arbitrary territories, as published in Erie R. R. Trf. 104-J, class rates to apply.

56531. Establish on **stone**, crushed, and **stone screenings**, in open top cars, Annandale, Branchton, Harrisville and Osbornes, Penn., to Meadville, Penn., 80c per net ton, via B. & L. E. R. R. direct, to expire with June 30, 1939.

56542. Establish on **crushed slag** or **crushed commercial slag** (other than granulated), in open top cars, C. L., Hamilton, O., to Bellefontaine, O., 110c per net ton.

56546. Establish on **limestone**, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb., from Gibsonburg, Maple Grove, Woodville, O., and other northwestern Ohio Group 1 origins to Strange Creek, 292c, and Villa Nova, W. Va., 281c per net ton.

56561. Establish on **slag**, crushed or crushed commercial, in open top cars, C. L., Jackson, O., to Wayne, W. Va., 143c per net ton.

56569 (2). Establish on **crushed stone**, C. L., from Poplar, Ky., to B. & O. R. R. stations in West Virginia, rates based on scale prescribed in I. C. C. 24394 for actual distances involved. (Representative proposed rates shown below.) Route: Rates will be specifically routed via Huntington, and Charleston, W. Va.

[Rates in cents per net ton on basis I. C. C. Docket 24394 (increased under Ex Parte 123.)]

From Poplar, Ky., to (Rep.) B. & O. Stas., Ripley Landing, W. Va., 165; Humphrey, W. Va., 176; Meyercord, W. Va., 187; Eureka, W. Va., 187; St. Marys, W. Va., 198; Rock Haven, W. Va., 198; to West Va. Short Line, via Brooklyn Jct., W. Va.; Minnie, W. Va., 209; Tri-State Gas Co., W. Va., 209; Pine Grove, W. Va., 209; to Ripley & Mill Creek Valley Branch, via Millwood, W. Va., Evans, W. Va., 187; to Ravenswood, Spencer & Glenville, Branch, via Ravenswood, W. Va., Silverton, W. Va., 187; Meadowdale, W. Va., 198; to Charleston Division, via Charleston, W. Va., Etowah, W. Va., 154; Barren Creek, W. Va., 165; Clay, W. Va., 176; Rockton, W. Va., 187.

56550. Establish on **lime**, C. L., Buffalo and Black Rock, N. Y., to Windsor, Ont., 23c, min. wt. 30,000 lb., and 18c min. wt. 50,000 lb., via Wabash Ry. direct.

56559. Establish on **tripoli**, C. L., min. wt. 40,000 lb., East St. Louis, Ill., to Toronto, Ont., 31c, and Montreal, Que., 49c, via usual routes (applies only on shipments originating at points shown in Note 3, page 85 of C. F. A. L. Trf 400-N).

56614. Establish on **fullers earth**, C. L., Olmsted, Ill., to Bay City, Mich., 680c, min. wt. 40,000 lb. (see Note), and 540c per net ton, min. wt. 70,000 lb. (see Note).

Note—When the carload charge based on the higher rate at actual wt. (but not less than the min. wt. specified for the higher rate), exceeds the charge based on the lower rate at actual wt. (but not less than the min. wt. specified for the lower rate), the latter charge will apply.

56622. Establish on **lime**, common hydrated, quick or slaked, C. L., Chicago, Ill., to Pinconning, Mich., 18c, min. wt. 30,000 lb., and 14c, min. wt. 50,000 lb.

56625. Establish on **core sand**, C. L., from the so-called Vassar Groups, viz.: Vassar, Wampson, McHale and Juniata, Mich., to Ironton, Ohio, 297c per net ton, in closed and open top cars.

56639 (a). Revise commodity description applicable in connection with rates and ratings on **roofing granules**, C. L., between pts. in C. F. A. territory, including Zone C territory in Wis. and W. T. L. "Northwest" territory, also from said territories to pts. E. of the W. T. of E. T. L., also Canada, to read as follows:

"Roofing granules, viz.: crushed or ground brick, gravel, slate or stone, in straight or mixed C. L., (See Note 3).

(b) To establish on **roofing granules**, viz.: crushed or ground brick, gravel, slate or stone, in straight or mixed C. L., (See Note 3), Danville, Ill., to Brantford and Hamilton, Ont., 480c per net ton.

56641. Establish on **limestone**, ground or pulverized, unburnt, C. L., min. wt. 60,000 lb., Speed, Ind., to Glendora, Ind., 187c per net ton.

56681. Establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, moulding or silica), in open cars, and **gravel**, C. L., Prestonburg, Ky., to Toms Creek, Coeburn, Caledonia, 154c; Drill, 165c; Swords Creek, 154c; Graceland, Raven, Jewell and Seaboard, Va., 165c per net ton, via C. & O. Ry., Elkhorn City, Ky., Clinchfield R. R., St. Paul, Va., N. & W. Ry.

56738 (1). Establish on **blocks**, viz.: **cement or concrete, building or paving**, C. L., min. wt. 60,000 lb., Evansville, Ind., to Shawneetown, Dales, Broughton, Francis, Rector, Eldorado, Grayson, Brooklyn, Equality and Lawler, Ill., 170c per net ton, viz., L. & N. R. R. direct.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason: No present or prospective movement.

Trunk

37120. To cancel commodity rate on **brick, tile and blocks, building** (nonornamental), made of sand, gravel and portland cement, C. L., from Lacona and Alder Creek, N. Y., to various points of destination on the N. Y. C. R. R. and West Shore R. R. (See Note 4.)

37248 (increase). To cancel commodity rates on **asphalt filler** 21c per 100 lb. and **shale filler** 18c per 100 lb., from Lincoln, N. J., to Haverstraw, N. Y., published in C. R. R. of N. J. Tariff I. C. C. G-5319. (b) To cancel commodity rate 21c per 100 lb., on **asphalt filler**, C. L., from C. R. R. of N. J. stations Jersey City to Elizabeth, N. J., to Baltimore, Md., stations and Holley, Del., published in C. R. R. of N. J. Tariff I. C. C. G-3092. (See Note 4.)

37253. **Chert**, C. L. (See Note 3), from McCoy, Va., to Albany, Batavia, Canastota and North Colins, N. Y., $4.02, Phelps, N. Y., $3.80, South Kearney, N. J., $3.36, Bridgeton, N. J., $3.25, and Hiwassee, Va., $1.38 per net ton, in lieu of present rates. Reason: Based on Docket 25220 scale.

37271. **Slate**, crushed, dust and ground, C. L., min. wt. 50,000 lb., from Bangor and Pen Argyl, Penn., to Lawrence, Mass., 20c per 100 lb.

Sup. 2 to 37271. **Slate**, crushed, dust and ground, C. L., min. wt. 50,000 lb., from Gladhill, Penn., to Lawrence, Mass., $5.27 per net ton, in lieu of present rates.

37320 (increase). To cancel commodity rate 64c per 100 lb. on **acidulated phosphate rock**, in bulk, C. L., from Alexandria, Va., to St. John, N. B., published in B. & O. R. R. Tariff I. C. C. 23074 (See Note 4).

37324. **Crude gypsum Rock**, C. L., (See Note 3), from New Brighton, N. Y., to Howes Cave, N. Y., $2.64 per ton, in lieu of present 6th class rate 21c per 100 lb.

37325. **Talc tailings**, testing less than 90 per cent through 200 mesh screen; **soapstone**, ground or pulverized, other than soapstone testing not less than 99 percent through 200 mesh; **soapstone**, crude, not ground or pulverized (not blocks or slabs); min. wt. 70,000 lb., from Street, Md., to Mannington, W. Va., 19c per 100 lb., in lieu of present rate 24c.

37327. **Asphalt filler**, C. L., min. wt. 60,000 lb., from Granville, Middle Granville, N. Y., Castleton and Poultney, Vt., to Nepperhan, N. Y., $2.53 per net ton in lieu of present rate 21c per 100 lb.

37331 (increase). To cancel commodity rate 59c per 100 lb., on **phosphate rock**, C. L., from Baltimore, Md., stations to St. John, N. B., Canada (See Note 4).

37332. **Ground slate**, C. L., min. wt. 50,000 lb., from Muncy, Penn., to stations in Quebec and Ontario, rates ranging from 25c to 30c per 100 lb., in lieu of present rates.

Sup. 1 to 37332. **Ground slate**, C. L., min. wt. 50,000 lb., from Whiteford, Cardiff, Md., Delta and Slate Hill, Penna.:

Proposed rate to Trois Rivieres, Que., 31; St. Jerome, Que., 29; Acton Vale, Que., 29; Hull, Que., 29; Magog, Que., 30; Valleyfield, Que., 29; Sherbrooke, Que., 30; Louisville, Que., 31; Cornwall, Ont., 29; Brookville, Ont., 27; Ottawa, Ont., 29.

In lieu of present sixth class rate.

37343 (shipper). (a) **Sand** (except naturally bonded molding; ground or pulverized sand), in open top cars, without tarpaulin or other protective covering; (b)

sand, naturally bonded molding, in all kinds of equipment; sand (except naturally bonded molding; ground or pulverized sand), in close equipment or in open top cars with tarpaulin or other protective covering; (See Note 3), from Dunbar, Penn., to West Virginia points, rates ranging from $1.10 to $2.31 per net ton.

Sup. 2 to 37181, cancel 37181 and Sup. 1 thereto (increase). To cancel all commodity rates on slag, C. L., from points in Trunk Line Association territory to Lennoxville and Sherbrooke, Que., (See Note 4).

37348. Lime, common, hydrated, quick or slaked, C. L., and dry building mortar, C. L., from stations shown in Item 9515, Sup. 21, to Agent Curlett's Tariff I. C. C. A-573 to Sandwich, Ont., 22c per 100 lb. on lime, min. Wt. 50,000 lb., and 28c per 100 lb. on lime and dry building mortar, min. wt. 30,000 lb.

37354 (shippers). Lime, fluxing, not ground, in bulk, C. L., min. wt. 70,000 lb., from Bellefonte, Pleasant Gap and Chemical, Penn., to Ivy Rock and Conshohocken, Penn., $2.20 per net ton, in lieu of present rate $2.42 per net ton.

Southern

18133 (carriers). Granite or stone, C. L., min. wt. 40,000 lb. Establish 35c cwt., Lithonia, Ga., to Port Everglades, Fla., for export to Cuba.

18141. Ground limestone, in closed equipment, C. L., min. wt. 60,000 lb. Establish rates from Rocky Point and Falling Spring, Va., to Clinchfield R. R. and Interstate R. R. stations in Southwest Va.

18242. Fluorspar, C. L. Establish 32c cwt. from Rosiclare, Ill., Crayne, Crider, Fredonia, Marion, Mexico, Princeton, Ky., to Jacksonville, Fla.

18248. Asphaltic limestone, C. L. Establish 275c net ton from Cherokee and Colrock, Ala., to St. Louis, Mo.

S. F. A. 4224. Stone, viz., jetty, rip rap or rubbel, C. L. Interterritorially between southern and official (including I. F. A.) territories. Cancel all present commodity rates and establish on jetty and rip rap stone, C. L., min. wt. 50,000 lb., rates made 15 per cent of first class using same first class rates used in connection other natural stone. Proposal does not affect rates within south or from I. F. A. to south.

Illinois

3373-A (O. R. M. V. To cancel proportional rates on bituminous rock, etc., stone, sand, etc., from all Ohio River crossings applicable on traffic from the south to O. R. M. V. points, published in I. F. A. T. B. Tariff 104-Q, I. C. C. 218, account through rates in effect.

3223. Proposal to establish Carrollton rates on sand and gravel, in straight or mixed C. L., present min. wt. from a gravel pit approximately 5 miles North of Carrollton, Tex., on the M. K. T. of T. R. R. to Texas destinations.

7496-C. Sand (except blast, engine, foundry, glass, moulding or silica) and gravel, in open top cars, Bloomington, Ill., (See Note 3).

To	Pres.	Prop.
Lilly, Ill.	220	69
Farmer City, Ill.	84	77
Mansfield, Ill.	84	77
Mahomet, Ill.	84	77
Champaign, Ill.	84	77
Urbana, Ill.	84	77

IRC 7496-1. Sand (except blast, core, engine, filter, etc., and gravel, in open top cars (See Note 3), from Bloomington, Ill., to the following Illinois points: rate changes include Ex Parte 123 increase; present rate of following is sixth class basis, proposed to Peoria 84c, East Peoria 84c, Crandall 79c, Deer Creek 79c, Goodfield 79c, Congerville 69c, Carlock 69c, Yuton 69c and Cheneyville 97c; present rate of following is 97c, proposed to Brokaw 69c, Holder 69c, Padua 69c, Ellsworth 69c, Arrowsmith 77c, Saybrook 77c, Derby 77c, Gibson City 84c, Elliot 84c, Perdueville 84c, Paxton 84c; present rate of following is 105c, proposed to Rankin 84c, East Lynn 84c, Hoopeston 97c.

7712-B (O. R. M. V.). To establish rate of $3 per net ton on ground limestone, C. L., Quincy, Ill., to Memphis, Tenn.

IRC 8602. Super-phosphate pile run, when shipped in bulk, C. L., min. wt. 100,000 lb., from Chicago Heights, Ill., to East St. Louis, Ill. Present—10c; proposed 12c.

Southwestern

15317. Lime (calcium), Neosho, Pierce City, Sequiota and Springfield, Mo., to Carteret, N. J. To establish through rates of 41c per 100 lb., min. wt. 30,000 lb. and 32c per 100 lb., min. 50,000 lb., from Neosho, Mo., Pierce City, Mo., Sequiota, Mo., and Springfield, Mo., to Carteret, N. J., based on the same rate scale (110 percent of I. C. C. Docket 16170) used in determining the present rates from Mosher and Ste. Genevieve, Mo.

15391. Slate, crushed or ground, Caddo Gap, Ark., to Shreveport, La. To establish rate of $1.65 per ton of 2000 lb. on crushed or ground slate, carloads, min. wt. 100,000 lb., or if marked capacity of the car furnished is less than 100,000 lb., minimum weight will be the marked capacity of the car, but not less than 80,000 lb., from Caddo Gap, Ark., to Shreveport, La.

15581. Limestone, ground, Ste. Genevieve, Mo., to St. Louis, Mo. Publish specifically the current rate of 94c per ton of 2000 lb. on ground limestone, from Ste. Genevieve, Mo., to St. Louis, Mo.

New England

45204. Crushed quartz rock (See Note 3), Keene, N. H., to Chester, Mass., Hartford, Conn., Pittsfield, Mass., Valley Falls, R. I., $1.93; New Bedford, Mass., Shelton, Conn., $2.20; and Westboro, Mass., $1.82. Reason: To establish commodity rates comparable with other commodity rates.

45320. Garnet rock dust, min. wt. 60,000 lb., from Converse, N. H., to Butler, Creighton, Ford City and Pittsburgh, Penn. Present—39. Proposed—30. Reason—To grant shippers a commodity rate comparable with other rates now published.

46038. Asphalt filler min. wt. 60,000 lb. (per gross ton):

	from	
To	Waterbury, Vt.	Johnson, Vt.
Berlin, N. H.	$2.53	$2.53
Boston, Mass.	3.03	3.19
Bridgeport, Conn.	3.30	3.58
Chicopee Falls, Mass.	2.92	3.19
Cliquot, Mass.	3.03	3.30
E. Walpole, Mass.	3.19	3.30
Lisbon, Mo.	3.03	3.03
Millis, Mass.	3.03	3.30
Stratford, Conn.	3.30	3.58
Winthrop, Me.	3.03	3.03

Reason—Proposed rates are on a comparable basis with those from other shipping points.

THE NEBRASKA RAILWAY COMMISSION recently ordered the Missouri Pacific and the Union Pacific Railroads to reduce from $2.30 to $1.80 per ton the freight rate on rip-rap from Nehawka, Nebr., to the Kingsley damsite near Ogallala. The two railroads, along with the Burlington, protested the order and have asked for a rehearing. About 500,000 tons of stone are involved in this project, and the plea for reduced rates was based on competition from Wyoming quarries.

Crushed-Stone Rate Adjustment

REVISION of the rates on crushed stone from quarries in western New York located from 8 to 46 miles eastward of Buffalo to destination in New York, Ohio and Pennsylvania, has been recommended by Examiner Claude A. Rice of the I.C.C. in No. 28020, General Crushed Stone Co. vs. Arcade & Attica et al., and cases joined with it, to replace the revision ordered in February, 1938, in No. 27714 in Buffalo Crushed Stone Co. vs. Arcade & Attica, 226, I.C.C. 309.

Examiner Rice said the commission should find that the assailed interstate rates on crushed stone from New York producing points to the destinations mentioned above were and for the future would be unduly prejudicial and preferential as between shippers to the extent that the joint line rates from Akron, Bowmansville, LeRoy, North LeRoy and Stafford, N. Y., were higher, mile for mile, but not otherwise unlawful, than the joint-service rates contemporaneously maintained on crushed stone from Cheektowaga, N. Y., to the same destinations.

Chalk and Limestone Whiting Rate Parity Recommended

RECOMMENDATION that chalk and limestone whiting be placed on a freight rate parity has been made by Examiner Charles M. Bardwell of the I.C.C. in a proposed report in No. 27921, Southwark Manufacturing Co. vs. Pennsylvania et al., and the large number of cases joined with it. He said the commission should find that the interstate rates on chalk whiting from Camden, N. J., to destination in official territory were not unreasonable in the past but unreasonable for the future to the extent that they may exceed 20 per cent of th concurrent first class rates, minimum 50,000 lb.; that any undue prejudice that may have existed will be removed by the rates recommended by him; that no violations of the fourth section have been shown and that reparation be denied.

In a further proposal hearing in No. 27162, intrastate rates in New Jersey on whiting, Examiner Bardwell said the commission should require the railroads to publish and maintain in lieu of the present intrastate rates, rates not less than the interstate rates recommended in No. 27921.

THE CENTROPOLIS CRUSHER CO., Kansas City, Mo., headed by T. J. Pendergast, recently purchased a 33-acre tract adjoining the company's property. Its development probably will be in the form of mines cut into the side of the hill on which the tract is situated.

ROADS whether mountain or farm to market under any condition
you can depend on
GRUENDLER EQUIPMENT
Established 1885

PORTABLE
HAMMER CRUSHERS
Ideal for farm to market road work. Crushes stone 2½ inch down to agriculture dust.

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JAW CRUSHERS
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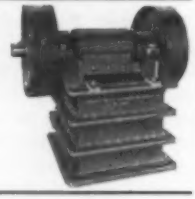
Small power Requirements



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QUALITY
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THE INDUSTRY

New Incorporations

Maryland Slate Corp., Trust Bldg., Baltimore, Md., has been granted a charter. Incorporators are James L. Watson and Henry C. Shelley.

Tiber Sand Co., Inc., is the name of a new corporation in Cullowhee, N. C., with an authorized capital stock of 150 shares of no par value common stock and 100 shares preferred stock par value $100. Subscribed stock is 30 shares preferred and 5 shares common, by Ruby Moss, Athens, Ga., H. H. Harris and Fred L. Sale, both of Asheville, Ga.

Norwalk Sand and Gravel Corp., Norwalk, Conn., has been granted a charter with an authorized capital of $50,000; amount commencing business, $8,000; par, $100. Incorporators are William J. Sculley, Daniel Deering and Edward J. Enson.

Construction Materials Co., 913 Jefferson Bldg., Peoria, Ill., has been incorporated to deal in and process sand, gravel and cement with a capital of 100 shares par value common stock at $100 a share. Incorporators are Timothy W. Swain, Herbig Younge, and Mary F. Dore. Correspondents are Bartley and Younge, 913 Jefferson Bldg., Peoria.

Globe Mica Co., Lineville, Ala., has filed papers for incorporation with a capitalization of $300,000. Incorporators are John M. Zeesman, Nels Olson and Joseph Toren.

Michigan Asbestos Mining Co., Grand Rapids, Mich., has filed corporation articles with $50,000 in common stock. Incorporators are H. J. Bylan, Win Jones, Jr., and Robert S. Tubbs.

The Shell Lime Co., Wilmington, N. C., has filed a certificate of incorporation to manufacture and sell all kinds of fertilizer and fertilizer materials with an authorized capital stock of $50,000 and a subscribed stock of $1,500. Incorporators are D. T. Bowden, Louise Gordon and Hamlin Briggs.

Manufacturers

Screen Equipment Co., Buffalo, N. Y., announces that C. Stuart Fielding of Toronto has joined their organization. Mr. Fielding has, for several years, been general sales manager of Canadian Gypsum Co., the Canadian subsidiary of U. S. Gypsum Co.

Oliver United Filters, Inc., New York, N. Y., reports that its export manager, J. F. Mitchell-Roberts has returned from a two-year trip which took him around the world. He travelled about 76,000 miles and covered practically every country in which the company has business interests with the exception of those in Latin America which he expects to visit later.

Macwhyte Co., Kenosha, Wis., announces the opening of a new branch office and warehouse in Seattle at 87 Holgate St. H. A. Kamp will have charge of the new office.

Worthington Pump and Machinery Corp., Harrison, N. J., announces the transfer of Edward Watson, refrigeration and air conditioning engineer, from its home office to its Atlanta district sales office. He will operate in North and South Carolina, Georgia, Florida and Alabama.

Alexander Milburn Co., Baltimore, Md., announces the appointment of Frank P. Snyder as sales representative in the Detroit area. Mr. Snyder was formerly sales engineer for the De Vilbiss Co.

Dempster Bros., Knoxville, Tenn., announces that the following equipment dealers are representing the company in the sale of Dempster-Dumpsters: Yancey Bros., Inc., Atlanta, for Georgia; Ajax Sales Co., Boston, for the six New England States; Choctaw Culvert & Machinery Co., Memphis, for west Tennessee and Arkansas; Dempster-Dumpster Sales Corp., 549 W. 54th St., New York City, for New Jersey, New York and Pennsylvania; Hunter Tractor & Machinery Co., Milwaukee, for Wisconsin and the upper peninsula of Michigan; C. T. Johnson, 4358 Coolidge Ave., Minneapolis, for South Dakota and Minnesota; and W. H. Gelatt, Des Moines, for the central and eastern section of Iowa.

Hanson Excavator Works, division of the Hanson Clutch & Machinery Co., Tiffin, Ohio, announce the appointment of O. E. Quinton as director of sales with headquarters at 224 S. Michigan Ave., Chicago, where the company has opened an office. Mr. Quinton has been associated with dealer organizations in the distribution of construction equipment for the past 10 years.

Hewitt Rubber Corp., Buffalo, N. Y., announces the appointment of the following new distributors: Joseph Glenn & Sons and their affiliate, E. P. Alexander & Sons, Clifton Heights, Penn.; Tools & Supplies, Inc., a new firm, headed by E. W. Bromwich, Indianapolis; Campbell Hardware & Supply Co., Seattle; Laurence Belting Co., New York City, and Everson Electric Co., Allentown, Penn.

Linde Air Products Co., 205 E. 42nd St., New York City, announces that T. D. Cartledge, formerly assistant general sales manager, has been appointed general sales manager.

Oxweld Acetylene Co., 205 E. 42nd St., New York City, has announced the election of J. N. Walker as vice-president. He formerly was general sales manager of the Linde Air Products Co.

Claude B. Schneible Co., 3951 Lawrence Avenue, Chicago, has made the following appointments: O. W. Anderson, Los Angeles, representative for southern California; Robert M. Taylor Company, San Francisco, for northern California; King Machinery Co., Cambridge, Mass., in the New England states; R. F. Skarnes, Minneapolis, Minn., the North Central territory; and Guy H. Rump, the St. Louis territory. L. C. Beers, formerly sales representative in the New England states has been transferred to the Chicago office to fill the capacity of assistant sales manager.

Union Chain and Mfg. Co., Sandusky, Ohio, has appointed C. E. Phillips & Co., 2750 Poplar Street, Detroit, Mich., its exclusive sales representative and stock carrying distributor in the territory of Detroit.

Pettibone Mulliken Corp., Chicago, has elected E. Joseph Seifert chairman of the board. H. J. Brazelton, former assistant secretary and assistant treasurer was elected secretary-treasurer. Walter Enstrom was elected to Brazelton's former position.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has established a branch office and warehouse at 1060 Broad street, Newark, N. J. C. A. Pihl is manager.

Trade Literature

The following literature, recently published, is available free, upon request to the respective sponsor:

Diesel tractors.—Caterpillar Tractor Co., Peoria, Ill., has issued a booklet setting forth the economies, advantages and capacities of the "Caterpillar" Diesel D4.

Alloy steel.—Joseph T. Ryerson & Son, Inc., Chicago, Ill. "Ryerson Certified Steels" pictorially explains the steel and allied products in Ryerson stock and includes a digest of standard and special alloys along with general hints on heat-treating.

Truck shovels.—Universal Power Shovel Corp., 1903 S. 62nd St., Milwaukee, Wis., has brought out bulletin No. 111 describing the Unit 310 truck shovel. The many illustrations show the adaptability of the shovel to varying conditions of excavating or material handling.

Pumps.—Peerless Pump Division, Massillon, Ohio. Bulletin P138-A describes the Peerless pumps. Colored cut-away illustrations show the operation of the various features of the pumps.

Trucks and trailers.—The Four Wheel Drive Auto Co., Clintonville, Wis., has issued the handbook, "Truck and Trailer Size and Weight Restrictions for 1939," which contains specifications for each state in the union.

Tractors.—The Cleveland Tractor Co., Cleveland, Ohio, has published a digest of features of design of the Cletrac crawler tractors. Each component part of the tractor is analyzed and illustrated.

Dust collecting equipment.—Pangborn Corp., Hagerstown, Md. The "Dust Hog" as a racketeer "in business for himself" is the fourth of the series of bulletins in the Pangborn "Dust Hog" campaign. It emphasizes the economies that can be effected by dust collection.

Mining Machinery.—Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has just released a new 96-page, profusely illustrated bulletin (No. 161) entitled, "Equipment for Metallic, Non-Metallic and Associated Industries," which covers equipment for the entire mineral and related industries.

Chain drives.—Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., has published a 48-page engineering data book, No. 1645, on its Silverstreak silent chain and Silverlink roller chain drives for automotive and stationary engines (timing and accessory driving).

Electrical equipment.—General Electric Co., Schenectady, N. Y., has issued a number of interesting bulletins. No. GEA-2989, entitled, "How To Make Cable Joints—Portable Cable" gives detailed instructions for splicing and vulcanizing all the principal types of rubber-insulated rubber-jacketed portable cables; No. GEA-2872 is explained by its title, "What Every Plant Operator Should Know About Metal-enclosed Switchgear"; No. GEA-2954 covers the reduced-voltage A-C magnetic starters; No. GEA-2964, the new G-E full-voltage magnetic motor starter; and No. GEA-594B illustrates, describes and gives ratings of various types of G-E automatic temperature-control equipment used to control all types of G-E heating equipment.

Trucks and Tractors.—Marmon-Herrington Co., Inc., Indianapolis, Ind., has brought out a group of bulletins which describe the Marmon-Herrington all-wheel-drive trucks and truck-tractors and show, by illustrations, the variety of conditions under which these units operate.

Plant Equipment—McNally-Pittsburg Mfg. Corp., Pittsburg, Kan., has issued an 80-page catalog, No. 637, which describes and profusely illustrates the many uses of the McNally-Pittsburg pulverizers, car dumps, conveyors and conveyor equipment, wire cloth, feeders, drives and power transmission machinery.

Hoists and Cranes.—American Hoist & Derrick Co., St. Paul, Minn., has recently issued catalogs describing and illustrating in detail the following "American" machinery: "American Gopher" 1½- to 2-cu. yd. shovel-crane-dragline (catalog No. 700-G-11), general purpose hoist (100-H-1), oil field engines (100-H-5), 40 and 50 ton locomotive cranes (600-L-2), heavy duty snow plows and wings (SNP-3) and mouldboard type snow plows.

Wagon Scrapers.—The Continental Roll & Steel Foundry Co., East Chicago, Ind., has issued an interesting bulletin called, "For Unusual Jobs Too," showing 4-, 5-, 7- and 10-cu. yd. wagon scrapers at work on unusual jobs.

Castings.—The American Manganese Steel Division of The American Brake Shoe & Foundry Co. "Amsco Alloy Heat and Corrosion Resistant Castings for Industrial Applications" has 24 illustrated pages of interesting information concerning the uses, physical properties and grades of Amsco alloy.

Material Handling Equipment.—General Conveyor & Mfg. Co., Inc., St. Louis, Mo., has issued a new catalog showing its line of portable and stationary equipment in operation.

Screens.—Symons Brothers Screen Co., 1462 N. Stanley Ave., Hollywood, Cal., has issued two booklets replete with photographs and drawings; one describes the Symons mud screen, the other the single and double deck screens.

Hammer Crushers.—Gruendler Crusher & Pulverizer Co., St. Louis, Mo., has issued a bulletin describing the economies of its "2 in 1" hammer crushers. It also contains interesting illustrations of the crusher in operation.

Vibrating screens.—Screen Equipment Co., Buffalo, N. Y., has just issued a new and attractive 40-page catalog illustrating and describing their complete line of "Seco" vibrating screens.

Need 3/4 Yard
AMERICAN GOPHER

A Speedy, Rugged, Versatile Money-Maker

Simple in design and rugged in construction, the Model 375 AMERICAN GOPHER — Shovel — Crane — Dragline — is fast, versatile; handles like an automobile. High operating speed insures a high daily yardage — and ruggedness insures steady production. A fast traveler. Write Department RP for Bulletin 700-G-5-2, just out.

American Hoist and Derrick Co.
Saint Paul, Minn.

AMERICAN TERRY DERRICK COMPANY
South Kearny, N. J.

Branch Offices
NEW YORK & CHICAGO

The Genuine
CROSBY CLIP

THE ROSS FEEDER

Completely controls the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Send full particulars for recommendation.

ROSS SCREEN & FEEDER CO.

19 Rector Street
NEW YORK, U. S. A.

2 Victoria Street
LONDON, S. W. I., ENGLAND

Plant Equipped to Meet Ohio Gravel Specifications

KILLBUCK SAND & GRAVEL CO., Killbuck, Ohio, has a modern sand and gravel plant near Brinkhaven on the Pennsylvania Railroad which is well-equipped to meet Ohio specifications for crushed gravel. The old plant was located at Killbuck.

At the new plant, completed in 1936, the average production is 100 tons per hr. Material in the deposit is removed with a Marion No. 21 steam shovel mounted on crawlers which dumps into Easton cars which are hauled over a narrow gauge track by Plymouth gasoline locomotive. Cars are dumped into a field hopper, and material is elevated on a 22-in. Robins belt conveyor, 85-ft. centers, to a 4- x 8-ft. Diester double-deck scalping screen. Oversize goes to a 9- x 36-in. Universal crusher. Material from the crusher and throughs from the scalping screen are then chuted to the Knickerbocker soft stone eliminator which reduces the soft stone content to two percent.

Material passing through the soft stone eliminator drops into the boot of the 22-in. Link-Belt conveyor, 202 ft. centers, which carry it to the top of the screening and washing plant.

The larger steel silo storage bins, shown in the illustration, are 20 ft. in diameter and 40 ft. high, and the two smaller bins are 20 ft. in diameter and 35 ft. high. Water for washing purposes is furnished by a 20-hp.. Peerless pump with a capacity of 600 g.p.m. operating against a head of 100 ft. Goodyear belting is used on both conveyors. In addition to the foregoing equipment, the plant has a model 82 Barber-Greene loader, a McMyler crawler crane, and a McMyler locomotive crane.

Use for Calcined Vermiculite Iridescent Stucco

BY LITERALLY turning their buildings "inside out," and using an inexpensive insulating material as a surface finish, stylists of the 1939 Golden Gate International Exposition have developed a cement stucco that glitters, under sunlight or illumination, with millions of gem-like sparkles.

The material is vermiculite, an alteration product of mica, quarried chiefly in Montana and Colorado. Expanded by electric heat to 15 or 20 times its original size, and distributed under several trade-names, vermiculite is widely used in insulating plaster, fireproof insulating board, acoustic plaster, composition roofing, interior decorative finish and light cement.

Seeking a distinctive finish for more than 200,000 sq. yds. of exterior stucco on Western's World's Fair buildings, stylists found that vermiculite, applied to wet stucco, imparted an interesting antique finish and gave back light at certain angles with iridescent effect. Low cost is an important factor in this first exterior-decorative use.

Different degrees of heat, in the expansion process, give the vermiculite different colors, ranging from silver to a deep copper gold. The Western World's Fair will use some 140 tons of a bright natural gold, gaining the atmosphere of the California gold rush in 1849. By day it will add texture, color and sparkle to the wall surfaces.

By night it will intensify the lighting through the textures of the popcorn-like material, and render the walls brilliant by reflecting highlights.

Sand and gravel plant equipped with soft stone eliminator to produce aggregates meeting Ohio specifications. Inset shows steam shovel, gasoline locomotive, and quarry cars

Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY

This is the publication which you find in every worthwhile plant in this industry where month after month it is USED every day to help the plant operators make better products and more profit. Daily contact with your advertising message makes such a lasting impression that maximum productiveness is the natural result.

Classified Directory of Advertisers

For alphabetical index see page 114

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Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.

Aerial Tramways
American Cable Co.
Hazard Wire Rope Co.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Agitators
Allis-Chalmers Mfg. Co.
Blaw, Knox Co.
Hetherington & Berner, Inc.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Air Compressors
Allis-Chalmers Mfg. Co.
Fuller Co.
Gardner-Denver Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Air Filters
Blaw-Knox Co.
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Babcock & Wilcox Co.

Air Separators
Babcock & Wilcox Co.
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Combustion Engr. Corp.
Gruendler Crusher & Pulv. Co.
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Raymond Pulv. Div. Research Corp.
Sly, W. W., Mfg. Co.
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Sturtevant Mill Co.
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Williams Patent Crusher & Pulv. Co.

Airveyors
Fuller Co.

Alloys (Metal)
Frog, Switch & Mfg. Co.

Arrestors, Lightning
General Electric Co.

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Barber-Greene Co.
Easton Car & Const. Co.
Gruendler Crusher & Pulv. Co.
Hetherinton & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.

Asphalt Mixer Regulators
Hetherington & Berner, Inc.

Asphalt Mixing Plants
Easton Car & Const. Co.
Hetherington & Berner, Inc.
Koehring Co.
Traylor Engineering & Mfg. Co.

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Easton Car & Constr. Co.

Babbitt Metal
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Dixie Machy. Mfg. Co.
Ryerson, Jos. T., & Son, Inc.

Backdiggers
Link-Belt Co.
Lima Locomotive Works, Inc. (Shovel & Crane Div.)

Backfillers
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Link-Belt Co.
Lima Locomotive Works, Inc. (Shovel & Crane Div.)
Northwest Engr. Co.

Bag Cleaning Machines
Link-Belt Co.
Stearns Mfg. Co.

Bagging Machines
Smidth, F. L., & Co.

Balers or Bundling Machines (Sack)
Besser Mfg. Co.
Stearns Mfg. Co.

Balls (Grinding)
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
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Traylor Engineering & Mfg. Co.

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Chicago Bridge & Iron Co.
Eagle Iron Works

Batchers, Measuring Volume
Besser Mfg. Co.
Blaw-Knox Co.
Chain Belt Co.
Fuller Company
Jaeger Machine Co.
Smith, T. L., Co.
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General Electric Co.

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Bearings (Anti-Friction)
Chain Belt Co.
Eagle Iron Works
Hetherington & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.

Bearings (Roller and Tapered Roller)
Link Belt Co.
Robins Conveying Belt Co.

Belting (Chain)
Chain Belt Co.

Belting (Elevator and Conveyor)
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Chain Belt Co.
Link-Belt Co.
Robins Conveying Belt Co.

Belting (Transmission)
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.

Belting (V Type)
Allis-Chalmers Mfg. Co.
Link-Belt Co.

Belt Fasteners or Hooks
Armstrong-Bray & Co.
Robins Conveying Belt Co.

Belt Idlers
Link Belt Co.
Robins Conveying Belt Co.
Smith Engineering Wks.

Belt Lacing
Armstrong-Bray Co.

Belt Lacing Machines
Armstrong-Bray & Co.

Belt Tighteners
Link-Belt Co.
Robins Conveying Belt Co.

Belt Trippers
Bacon, Earle Co., Inc.
Chain Bet Co.
Link-Belt Co.
Robins Conveying Belt Co.

Bin Gates
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chain Belt Co.
Chicago Bridge & Iron Co.
Eagle Iron Works
Fuller Co.
Gruendler Crusher & Pulv. Co.
Heltzel Steel Form & Iron Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Pioneer Engr. Wks., Inc.
Smith Engineering Works
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Bin Indicators
Fuller Co.

Bins (Storage)
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chain Belt Co.
Chicago Bridge & Iron Co.
Eagle Iron Works
Heltzel Steel Form & Iron Co.
Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Works, Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Blasting Caps
Atlas Powder Co.
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Blasting Cap Crimpers
Ensign-Bickford Co.

Blasting Machines
Atlas Powder Co.
DuPont, E. I., de Nemours & Co., Inc.

Blasting Supplies
Atlas Powder Co.
DuPont, E. I., de Nemours & Co., Inc.
Ensign-Bickford Co.

Block Machines, Building
Anchor Concrete Machinery Co.
Besser Mfg. Co.
Kent Machine Co.
Multiplex Concrete Machy Co
Stearns Mfg. Co.
Zagelmeyer Cast Stone, Block Machy. Co.

Block Racks
Kent Machine Co.

Blocks (Pillow)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Link-Belt Co.
Robins Conveying Belt Co.

Blocks (Sheave)
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Roebling's, John A., Sons Co.,
Sauerman Bros.

Blowers
Allis-Chalmers Mfg. Co.
Sly, W. W., Mfg. Co.

Boats
Chicago Bridge & Iron Co.

Boats (Self-Unloading)
Chicago Bridge & Iron Co.
Link-Belt Co.
Robins Conveying Belt Co.

Boilers
Babcock & Wilcox Co.
Combustion Engineering Corp.

Brick Machines
Besser Mfg. Co.
Multiplex Concrete Mach. Co.
Stearns Mfg. Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Jaeger Machine Co.
Link-Belt Co.
Robins Conveying Belt Co.

Buckets (Dragline and Slackline)
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Gruendler Crusher & Pulv. Co.
Hayward Company
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Buckets (Dredge & Excavator)
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Co.

Buckets (Dump)
Brooks Equipt. & Mfg. Co., Inc.
Jaeger Machine Co.

Buckets (Electric Heated, Weighing)
Easton Car & Constr. Co.

Buckets (Elevator and Conveyor)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Brooks Equipt. & Mfg. Co.
Chain Belt Co.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engr. Wks.

Building Tile Machines
Besser Mfg. Co.
Multiplex Concrete Machy. Co
Stearns Mfg. Co.

Bulk Cement Batching Plants
Heltzel Steel Form & Iron Co.

Bulk Cement Storage Plants
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Heltzel Steel Form & Iron Co.
Link-Belt Co.
Smidth, F. L., & Co.

Bulldozers
Blaw-Knox Co.
Bucyrus-Erie Co.
Koehring Co.

Bullscrapers
Bucyrus-Erie Co.

Bushings
Eagle Iron Wks.
Link-Belt Co.

Cableways
American Cable Co. Inc.
Blaw-Knox Co.
Gilmore Wire Rope Div.
Hazard Wire Rope Co.

GULF RESEARCH TECHNICIANS develop improved lubricants . . . help industry reduce operating costs!

PICTURED above is a typical scene in the Gulf research laboratories. Gulf technologists, in this instance, are working with an experimental Diesel engine, studying Diesel lubrication problems. Nearby, another exhaustive research goes forward on the lubrication of a modern type of textile spindle. In the next room a railroad car bearing is being run under precisely the speed and load conditions of actual service. And a host of other lubrication problems —many of them born of our rapidly advancing mechanical age—are being studied each day by Gulf's large staff of scientific men.

To what end is this extensive research work carried on? What is its objective? By perfecting better lubricants, and better methods of applying them, Gulf is doing its part to *help industry reduce operating costs*—save money on maintenance and power, improve production and make the machinery for which you paid real money last longer.

These Gulf technologists are examining pistons and rings removed from the experimental Diesel engine shown above, after an extended period of operation. They find that ring sticking, cylinder wear, ring wear, gum formation and objectionable deposits have been minimized by the proper use of the right grades of Gulf's higher quality Diesel lubricants.

Your machinery, old or new, will be better prepared to give you the efficient production you need when you protect it with Gulf's higher quality oils and greases. Available to you, through more than 1100 warehouses in 28 states, is Gulf's complete line of 400 quality oils and greases . . . and the services of an experienced Gulf lubrication engineer. Ask him to recommend proper lubrication for your equipment. GULF OIL CORPORATION, GULF REFINING COMPANY, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

Classified Directory (Cont.)

Jones & Laughlin Steel Corp.
Leschen, A., & Sons Rope Co.
Link-Belt Co.
Roebling's, John A., Sons Co.,
Sauerman Bros.

Cables (Electric)
General Electric Co.

Calcining Equipment
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg Co.

Calcium Chloride
Du Pont, E. I., de Nemours & Co.

Capacitators
General Electric Co.

Capstans
Link-Belt Co.
Robins Conveying Belt Co.

Car Couplings & Hitches
Easton Car & Constr. Co.

Cars (Block, Dump, Industrial, Etc.)
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Eagle Iron Works
Easton Car & Constr. Co.
Link-Belt Co.
Multiplex Concrete Mach. Co.
Sanford Day Iron Works
Stearns Mfg. Co.
Traylor Engineering & Mfg Co.

Car Dumps
Eagle Iron Wks.
Easton Car & Constr. Co.
Link-Belt Co.
Traylor Engr. & Mfg. Co.

Car Pullers & Movers
Chain Belt Co.
Gilmore Wire Rope Riv.
Jones & Laughlin Steel Corp.
Link-Belt Co.
Robins Conveying Belt Co.

Car Wheels
Eagle Iron Wks.
Easton Car & Constr. Co.
Link-Belt Co.

Carts (Concrete)
Blaw-Knox Co.
Jaeger Machine Co.
Link-Belt Co.
Robins Conveying Belt Co.

Castings
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Bacon, Earle C., Co.
Blaw-Knox Co.
Chain Belt Co.
Dixie Machinery Mfg. Co.
Eagle Iron Works (Grey Iron)
Frog, Switch & Mfg. Co.
Hetherington & Berner, Inc.
Lima Locomotive Works, Inc. (Shovel & Crane Div.)
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Cement Plants (Contractor)
Allis-Chalmers Mfg. Co.
Gruendler Crusher & Pulv. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg Co.

Cement Colors
Mepham, Geo. S., Corp.
Ricketson Mineral Color Wks.

Cement Process
Cement Process Corp.

Cement Pumps
Fuller Co.
Smidth, F. L., & Co.

Central Mixing Plants (Concrete)
Blaw-Knox Co.
Chain Belt Co.
Heltzel Steel & Iron Co.
Jaeger Machine Co.

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Chain Belt Co.
Link-Belt Co.

Chain (Elevating and Conveying)
Bacon, Earle C., Co.
Brooks Equipt. & Mfg. Co.
Chain Belt Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.

Chimney Block Machines and Molds
Besser Mfg. Co.

Chutes (Bin, Truck, Concrete, Etc.)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earl C. Bacon, Inc.
Blaw-Knox Co.
Chain Belt Co.
Chicago Bridge & Iron Co.
Cross Engr. Co.
Eagle Iron Works
Fuller Co.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg Co.

Chute Liners
Bacon, Earle C., Inc.
Cross Engr. Co.
Frog, Switch & Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Circuit Breakers
Allis-Chalmers Mfg. Co.
General Eectric Co.

Circuit Testers
Atlas Powder Co.
du Pont, E. I., De Nemours & Co.
General Electric Co.
Hercules Powder Co.

Clarifiers
Chain Belt Co.
Link-Belt Co.

Classifiers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Eagle Iron Works
Link-Belt Co
Nordberg Manufacturing Co
Pioneer Engineering Wks., Inc.
Research Corp.
Sly, W. W., Mfg. Co.
Smidth, F. L., & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Universal Vibr. Screen Co.
Western Precipitation Corp.
Williams Patent Crusher & Pulv. Co.

Clutches
Allis-Chalmers Mfg. Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Stearns Mfg. Co.

Coal Pulverizing Equipment
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Babcock & Wilcox Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Pennsylvania Crusher Co.
F. L. Smidth & Co.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Concrete Mixers
Anchor Concrete Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chain Belt Co.
Gruendler Crusher & Pulv. Co.
Jaeger Machine Co.
Kent Machine Co.
Koehring Co.
Multiplex Concrete Machy. Co
Smith, T. L., Co.
Stearns Mfg. Co.

Concrete Reinforcements (Expanded Metal)
Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.

Controllers (Electric)
Allis-Chalmers Mfg. Co.
General Electric Co.

Converters (Electric)
Allis-Chalmers Mfg. Co.
General Electric Co.

Conveyors (Apron)
Allis-Chalmers Mfg. Co.
Barber-Greene Co.
Chain Belt Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engr. & Mfg. Co.

Conveyors (Belt)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon
Barber-Greene Co.
Besser Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Fuller Company
Gilmore Wire Rope Div.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Jones & Laughlin Steel Corp.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Stearns Mfg. Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Conveyors (Drag-Chain)
Diamond Iron Wks., Inc.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.

Conveyors (Overhead)
Chain Belt Co.

Conveyors (Pan)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Link-Belt Co.

Conveyors (Pneumatic)
Fuller Company
Gruendler Crusher & Pulv. Co.

Conveyors (Portable)
Austin-Western Road Machy. Co.
Barber-Greene Co.
Dramond Iron Wks., Inc.
Fuller Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.

Conveyors (Screw)
Besser Mfg. Co.
Chain Belt Co.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Link-Belt Co.

Conveyors (Trolley)
Chain Belt Co.
Link-Belt Co.
Stearns Mfg. Co.

Conveyors (Vibrating)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Link-Belt Co.
Smidth, F. L., & Co.

Conveyor Idlers & Rolls
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Barber-Greene Co.
Chain Belt Co.
Diamond Iron Wks.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Coolers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Coolers (Clinker)
Fuller Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Correcting Basins
F. L. Smidth & Co.

Couplings (Flexible and Shaft)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smith, T. L., Co.

Cranes (Diesel Electric Steam, Etc.)
American Hoist & Derrick Co.
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.

Cranes (Tractor)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Link-Belt Co.

Crawler Attachments
Allis-Chalmers Mfg. Co.
Koehring Co.
Link-Belt Co.

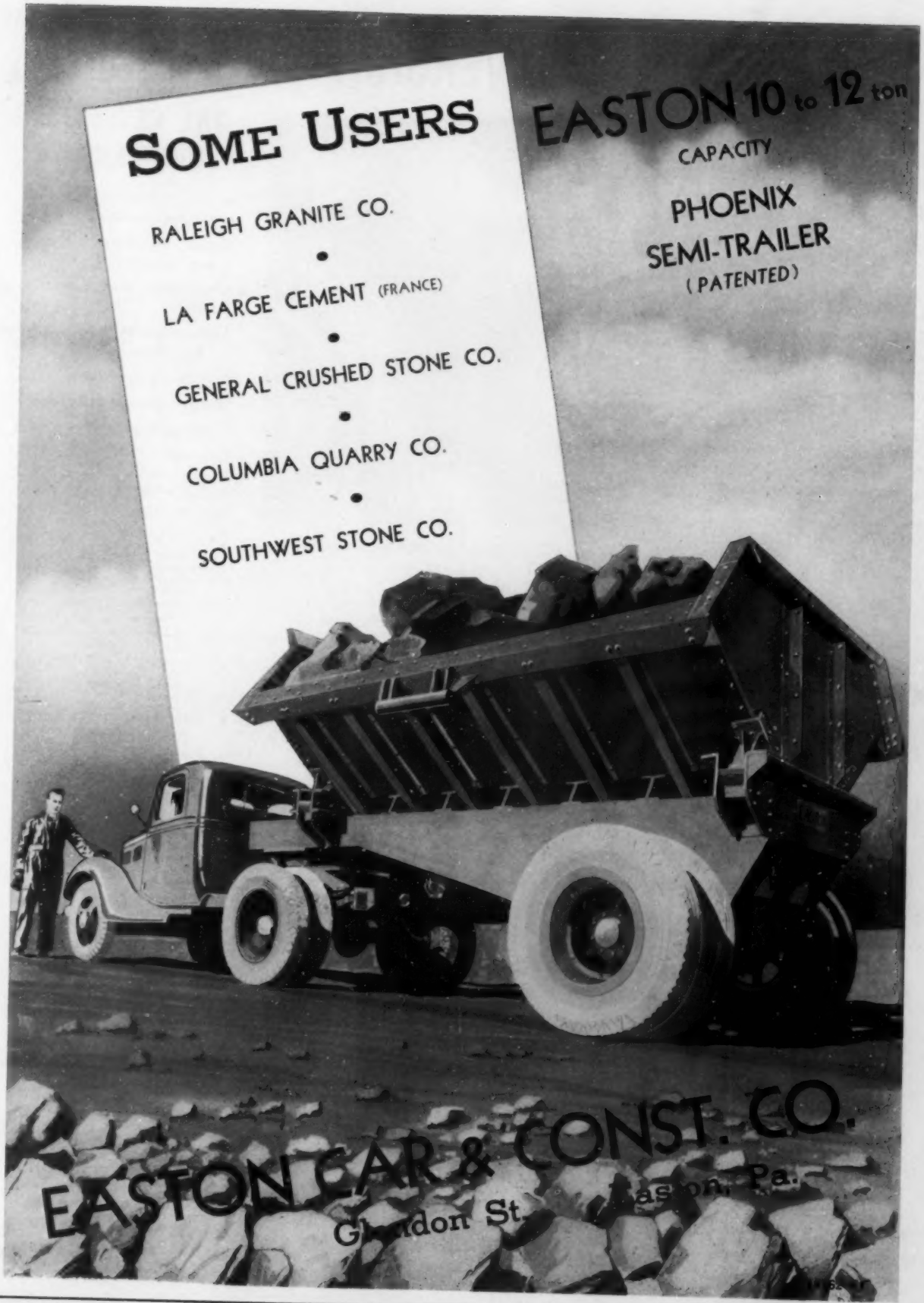
Crawling Tractor Excavators
Austin-Western Road Machy. Co.
Link-Belt Co.

Crusher Parts
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co., Inc.
Dixie Machinery Mfg. Co.
Eagle Iron Works
Frog, Switch & Mfg. Co.
Gruendler Crusher & Pulv. Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Traylor Engr. & Mfg. Co.

Crushers (Cone)
Nordberg Mfg. Co.

Crushers (Hammer)
Allis-Chalmers Mfg. Co.
American Pulv. Co.
Austin-Western Road Machy. Co.
Brooks Equipment & Mfg. Co.
Dixie Machy. Mfg. Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.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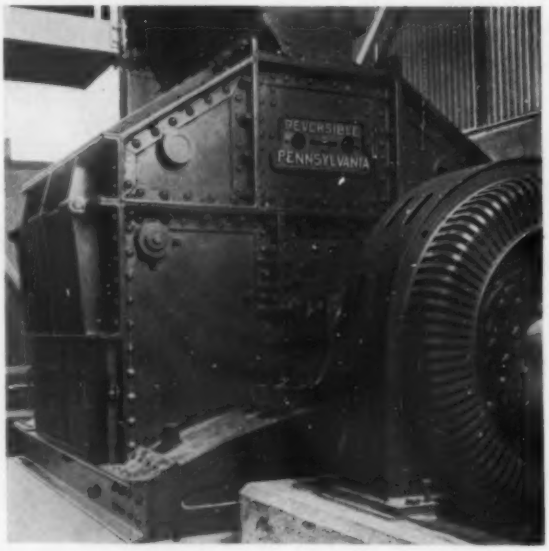

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Classified Directory (Cont.)

Earle C. Bacon, Inc.
Brooks Equipment Mfg. Co.
Diamond Iron Wks., Inc.
Dixie Machinery Mfg. Co.
Gruendler Crusher & Pulv. Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Laboratory)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co.
Dixie Machinery Mfg. Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Primary Breakers)

Allis-Chalmers Mfg. Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Reduction)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.

Crushers (Ring)

American Pulverizer Co.
Dixie Machinery Mfg. Co.
Gruendler Crusher & Pulv. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Roll)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Babcock & Wilcox Co.
Bacon, Earle C., Co.
Besser Mfg. Co.
Brooks Equipment & Mfg. Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Universal Crusher Co.
Williams Patent Crusher & Pulv. Co.

Crushing Rolls

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Babcock & Wilcox Co.
Diamond Iron Wks., Inc.
Eagle Iron Wks.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushing and Screening Plants (Portable)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Barber-Greene Co.
Blaw-Knox Co.
Brooks Equipment & Mfg. Co.
Diamond Iron Wks., Inc.
Dixie Machinery Mfg. Co.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Heltzel Steel Form & Iron Co.
Link-Belt Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Tyler, W. S. Co.
Universal Vibrating Screen Co.
Williams Patent Crusher & Pulv. Co.

Curing Racks

Besser Mfg. Co.
Multiplex Concrete Machy. Co.
Stearns Mfg. Co.

Decks, Vibrating Screen

Hendrick Mfg. Co.

Dedusters

Blaw-Knox Co.
Western Precipitation Co.

Dehydrators

Pioneer Engineering Wks., Inc.

Derricks

American Hoist & Derrick Co.
Hayward Company

Detonators

Atlas Powder Co.
Du Pont & Co.
Ensign-Bickford Co.
Hercules Powder Co.

Dewatering Machines

Allis-Chalmers Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Eagle Iron Wks.
Jaeger Machine Co.
Link-Belt Co.

Diaphragms (Rubber)

Jaeger Machine Co.

Dippers & Teeth (Dredge & Shovel

Bucyrus-Erie Co.
Frog, Switch & Mfg. Co.
Koehring Co.
Link-Belt Co.
Marion Steam Shovel Co.

Disentegrators

Smidth, F. L., & Co.

Ditchers

Barber-Greene Co.
Bucyrus-Erie Co.
Link-Belt Co.
Marion Steam Shovel Co.

Dragline & Cableway Excavators

American Cable Co.
American Hoist & Derrick Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Diamond Iron Wks., Inc.
Hazard Wire Rope Co.
Koehring Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Dredges

American Hoist & Derrick Co.
Bucyrus-Erie Co.
Eagle Iron Works
Hayward Co.
Hetherington & Berner, Inc. (Complete Steel)
Link-Belt Co.
Marion Steam Shovel Co.

Classified Directory (Cont.)

Dredge Cutter Heads & Ladders
Bucyrus-Erie Co.
Eagle Iron Wks.
Hetherington & Berner, Inc.

Dredge Hulls
Chicago Bridge & Iron Co.
Eagle Iron Wks.

Dredging Sleeves
Hetherington & Berner, Inc.
Thermoid Rubber Co.

Drills (Blast Hole)
Bucyrus-Erie Co.
Gardner-Denver Co.

Drills (Hand Hammer)
Gardner-Denver Co.

Drills (Rock)
Bucyrus-Erie Co.
Gardner-Denver Co.

Drills (Wagon)
Gardner-Denver Co.

Drills (Well)
Bucyrus-Erie Co.

Drill Bits
Bucyrus-Erie Co.

Drill Sharpening Machines
Bucyrus-Erie Co.
Gardner-Denver Co.

Drill Steel
Gardner-Denver Co.

Drilling Accessories
Bucyrus-Erie Co.
Gardner Denver Co.

Drives (Belt, Chain and Rope)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chain Belt Co.
Diamond Iron Works, Inc.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Chain Belt Co.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Worm)
Link-Belt Co.

Dryers
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Gruendler Crusher & Pulv. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Western Precipitation Co.
Williams Patent Crusher & Pulv. Co.

Dust Arrestors
Blaw-Knox Co.
Western Precipitation Co.

Dust Collector Bags
Blaw-Knox Co.
Sly, W. W., Mfg. Co.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Research Corp.
Sly, W. W., Mfg. Co.
Smidth, F. L., & Co.
Sturtevant Mill Co.
Western Precipitation Co.

Dust Conveying Systems
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Fuller Company
W. W. Sly Mfg. Co.
Western Precipitation Co.

Dust Filers
Western Precipitation Co.

Dust Precipitators
Research Corp.
Western Precipitation Co.

Dust Recovery Plants
Sly, W. W., Mfg. Co.
Western Precipitation Co.

Dynamite
Atlas Powder Co.
Du Pont Co.
Hercules Powder Co.

Electric Cables
General Electric Co.

Electric Motors
Allis-Chalmers Mfg. Co.
General Electric Co.
Hayward Co.

Electric Motor Starters
Allis-Chalmers Mfg. Co.
General Electric Co.

Elevators
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Besser Mfg. Co.
Chain Belt Co.
Cross Engineering Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Fuller Company
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Kent Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engineering Works
Stearns Mfg. Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Engineers (Designing & Consulting)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Blaw-Knox Co.
Fuller Co.
Gruendler Crusher & Pulv. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Productive Equipment Corp.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Engines (Diesel, Gasoline, Kerosene and Oil)
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Caterpillar Tractor Co.
Cummins Engine Co.
National Supply Co.
Nordberg Mfg. Co.
Superior Diesel

Engines (Natural Gas)
Allis-Chalmers Mfg. Co.

Engines (Steam)
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Nordberg Mfg. Co.

Explosives
Atlas Powder Co.
Du Pont Co.
Hercules Powder Co.

Fans (Exhaust & Ventilating)
Blaw-Knox Co.
General Electric Co.
Gruendler Crusher & Puv. Co.
Sly, W. W., Mfg. Co.
Smidth, F. L., & Co.

Feeders
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Earle C Bacon, Inc.
Barber-Greene Co.
Besser Mfg. Co.

● In Quebec, a Gardner-Denver "WBH" Compressor, with "Caterpillar" Diesel drive, has been in operation for 2½ years—running on an average of two 8-hour shifts a day. Thus far, *only 20 minutes* working time has been lost on account of repairs—and the repairs cost $1.20. Fuel and lubricating costs for the 2½ years' period have averaged only 55c per hour.

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Classified Directory (Cont.)

Blaw-Knox Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Fuller Co.
Gruendler Crusher & Pulv. Co.
Hetherington & Berner, Inc.
Kent Machine Co.
Link-Belt Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Schaffer Poidometer Co.
Smidth, F. L., & Co.
Smith Engr. Wks.
Stearns Mfg. Co.
Traylor Engineering & Mfg. Co.

Filter Cloth
Roebling's, John A., Sons Co.,
Tyler, W. S., Co.

Finished Cement Grinding Aid
Dewey & Almy Chemical Co.

Forges
Gardner-Denver Co.

Forgings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.

Frogs & Switches
Easton Car & Const. Co.
Frog, Switch & Mfg. Co.

Fuels (Diesel)
Texas Co.

Furnaces (Heat Treating, Electric)
General Electric Co.

Fuses (Detonating and Safety)
Atlas Powder Co.
Ensign-Bickford Co.
Hercules Powder Co.

Fuses (Electric)
General Electric Co.

Fuse Cutouts
General Electric Co.

Fuse Cutters
Ensign-Bickford Co.

Fuse Lighters
Ensign-Bickford Co.

Galvanometers
Atlas Powder Co.
General Electric Co.
Hercules Powder Co.

Gasoline
Gulf Refining Co.
Texas Company

Gas Producers
Blaw-Knox Co.

Gears
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Frog, Switch & Mfg. Co.
General Electric Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Gear-Motors
Allis-Chalmers Mfg. Co.
General Electric Co.
Link-Belt Co.

Generators & Motor Generator Sets
Allis-Chalmers Mfg. Co.
General Electric Co.
National Supply Co.
Nordberg Mfg. Co.
Superior Diesel

Gloves
Sly, W. W., Mfg. Co.

Grapples
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Co.

Grating
Blaw-Knox Co.
Eagle Iron Wks.
Hendrick Mfg. Co.

Grease
Bacon, Earle C., Co.
Gulf Refining Co.
Texas Company

Grease Cups
Link-Belt Co.
Robins Conveying Belt Co.

Grinding Aids
Dewey & Almy Chemical Co.

Guards (Machinery)
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Tyler, W. S., Co.

Guns (Hydraulic & Spray)
Hetherington & Berner, Inc.

Gypsum Plants
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Traylor Engr. & Mfg. Co.

Hangers, Anchor & Inserts (Concrete)
Allis-Chalmers Mfg. Co.

Haulage Systems (Electric)
General Electric Co.

Haulage Systems (Remote Control)
General Electric Co.
Koehring Co.

Heaters (Bitumen)
Easton Car & Const. Co.

Helmets
Sly, W. W., Mfg. Co.

Hoists (Chain, Electric, Portable, Skip, Etc.)
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Besser Mfg. Co.
Chain Belt Co.
Commercial Shearing & Stamping Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Easton Car & Const. Co.
Gardner-Denver Co.
Gruendler Crusher & Pulv. Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Northwest Engineering Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Sauerman Bros., Inc.
Smith Engr. Wks.
Stearns Mfg. Co.
Traylor Engineering & Mfg. Co.

Hoppers
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chain Belt Co.
Chicago Bridge & Iron Co.
Gruendler Crusher & Pulv. Co.
Heltzel Steel Form & Iron Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Hose (Water, Steam, Air Drill, Pneumatic, Sand Suction and Discharge)
Dixie Machinery Mfg. Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Sly, W. W., Mfg. Co.
Thermoid Rubber Co.

Hose (Sand Blast)
Sly, W. W., Mfg. Co.

Hydrators (Lime)
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Traylor Engr. & Mfg. Co.

Jigs (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Traylor Engineering & Mfg. Co.

Joists & Slab Machines (Concrete)
Besser Mfg. Co.

Kilns Parts
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Kilns (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Kilns (Vertical)
Blaw-Knox Co.
Chicago Bridge & Iron Co.

Kiln Burners
Babcock & Wilcox Co.
Smidth, F. L., & Co.

Kiln Chain Systems
Smidth, F. L., & Co.

Kiln Liners (Metal)
Traylor Engr. & Mfg. Co.

Kominuters
Smidth, F. L., & Co.

Laboratory Apparatus
Smidth, F. L., & Co.

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Besser Mfg. Co.
Stearns Mfg. Co.

Lime Handling Equipment
Chicago Bridge & Iron Co.
Fuller Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Lime Plants
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Gruendler Crusher & Pulv. Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Lime Putty Plants
Chicago Bridge & Iron Co.

Loaders (Bin, Car, Hopper, Truck, Etc.)
Barber-Greene Co.
Besser Mfg. Co.
Bucyrus-Erie Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Fuller Company
Gardner-Denver Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Robins Conveying Belt
Ross Screen & Feeder Co.
Stearns Mfg. Co.

Loaders (Boat)
Chain Belt Co.
Fuller Co.
Link-Belt Co.

Loaders (Box Car)
Barber-Greene Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.

Loaders (Underground)
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Diamond Iron Wks., Inc.
Nordberg Mfg. Co.

Locomotives (Diesel & Diesel-Electric
Davenport-Besler Corp.

Locomotives (Electric, Trolley & Storage Battery)
Davenport-Besler Corp.
General Electric Co.

Locomotives (Gasoline & Gas-Electric)
Davenport-Besler Corp.
General Electric Co.

Locomotives (Oil & Oil Electric)
General Electric Co.

Locomotives (Steam)
Davenport-Besler Corp.

Locomotive Stack Netting
Tyler, W. S., Co.

Lubricants
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
Texas Co.

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Robins Conveying Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Magnetic Separators
Allis-Chalmers Mfg. Co.
Diamond Iron Wks., Inc.
Link-Belt Co.
Robins Conveying Belt Co.

Magnets
General Electric Co.

Manganese Steel Parts
Bacon, Earle C., Inc.
Dixie Mach. Mfg. Co.
Frog, Switch & Mfg. Co.

Manhole Block Machine (Concrete)
Stearns Mfg. Co.

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Austin-Western Road Machy. Co.
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Diamond Iron Wks., Inc.
Fuller Company
Gruendler Crusher & Pulv. Co.
Heltzel Steel Form & Iron Co.
Link-Belt Co.
Robins Conveying Belt Co.

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Fuller Co.
General Electric Co.
Heltzel Steel Form & Iron Co.
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Schaffer Poidometer Co.

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Theirmoid Rubber Co.

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Blaw-Knox Co.
Gruendler Crusher & Pulv. Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Mills, Grinding (Ball, Tube, Hammer, Rod, Roll, Etc.) (See also Pulverizers)
Allis-Chalmers Mfg. Co.
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Babcock & Wilcox Co.
Brooks Equipment & Mfg. Co.
Dixie Machinery Mfg. Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

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Babcock & Wilcox Co.
Dixie Machy. Mfg. Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Mortar Colors
Menham, Geo. S., Corp.
Ricketsen Mineral Color Wks.

Mortar Mixers
Chain Belt Co.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Jaeger Machine Co.

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Chain Belt Co.
Link-Belt Co.

Nozzles (Sand Blast)
Sly, W. W., Mfg. Co.

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Smidth, F. L., & Co.

Oils (Lubricating)
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
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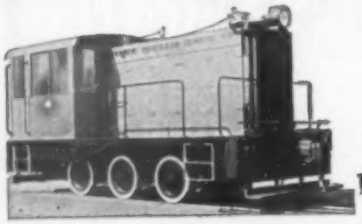

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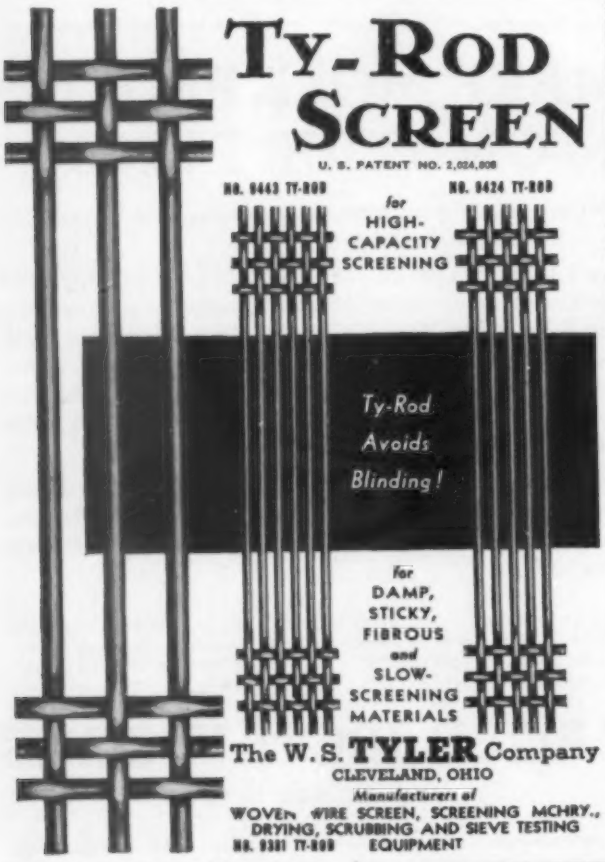

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Multiplex Concrete Machy Co.
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Eagle Iron Works
Traylor Engineering & Mfg. Co.

Perforated Metal
Allis-Chalmers Mfg. Co.
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Chicago Perforating Co.
Cross Engineering Co.
Gruendler Crusher & Pulv. Co.
Harrington & King Perf. Co
Hendrick Mfg. Co.
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Robins Conveying Belt Co.
Joseph T. Ryerson & Son, Inc.
Standard Stamping & Perforating Co.
Traylor Engr. & Mfg. Co.

Perforated Screen Plates & Cloth—See Screen Cloth & Plates

Pinions
Bacon, Earle C., Inc.
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Frog, Switch & Mfg. Co.
General Electric Co.
Link-Belt Co.

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Besser Mfg. Co
Concrete Pipe Machy. Co.
Stearns Mfg. Co.
Universal Concrete Pipe Co.

Pipe
Chicago Bridge & Iron Co.
Frog, Switch & Mfg. Co.
Hetherington & Berner, Inc.
Naylor Pipe Co.

Pipe Fittings
Hetherington & Berner, Inc.
Naylor Pipe Co.

Pipe Forms & Machines (Concrete)
Universal Concrete Pipe Co.

Plaster Colors
Mepham, Geo. S., Corp.

Plaster Mixers
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Jaeger Machine Co.

Plaster Plants
Koehring Co.

Poidometers
Schaffer Poidometer Co.

Pontoons
Chicago Bridge & Iron Co.
Diamond Iron Wks., Inc.
Eagle Iron Works

Powder (Blasting)
Atlas Powder Co.
Du Pont Co.
Hercules Powder Co.

Powder Magazines
Du Pont Co.
Hercules Powder Co.

Power Transmission Machinery
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Power Units
Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.
Nordberg Mfg. Co.

Pulleys
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Chain Belt Co.
Diamond Iron Wks., Inc.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Robins Conveying Belt Co.

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Dixie Machinery Mfg. Co.
Frog, Switch & Mfg. Co.
Gruendler Crusher & Pulv. Co.
Smidth, F. L., & Co.

Pulverizers (Hammer, Ring, Rod & Roll) (See Also Mills & Crushers)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Babcock & Wilcox Co.
Blaw-Knox Co.
Brooks Equipment & Mfg. Co.
Dixie Machy. Mfg. Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Pumps (Diaphragm)
Chain Belt Co.
Jaeger Machine Co.

Pumps (Dredge)
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Hetherington & Berner, Inc.

Pumps (Dry Pulverized Material)
Babcock & Wilcox Co.
Fuller Company
Smidth, F. L., & Co.

Pumps (Slurry)
Allis-Chalmers Mfg. Co.
Smidth, F. L., & Co.
Wilfley, A. R., & Sons, Inc.

Pumps Valves (Slurry)
Fuller Co.
Wilfley, A. R., & Son, Inc.

Pumps (Vacuum)
Allis-Chalmers Mfg. Co.
Fuller Company
Gardner-Denver Co.
Smidth, F. L., & Co.

Pump Valves (Dry Pulverized Material)
Fuller Co.

Pumps (Water)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Gardner-Denver Co.
Jaeger Machine Co.

Railway Equipment
Easton Car & Const. Co.
General Electric Co.

Railways (Electric)
General Electric Co.

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Allis-Chalmers Mfg. Co.
General Electric Co.

Recuperators
Traylor Engineering & Mfg. Co.

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Babcock & Wilcox Co.
Smidth, F. L., & Co.

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Allis-Chalmers Mfg. Co.
General Electric Co.

Rewashers (Screw)
Eagle Iron Wks.
Link-Belt Co.
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Atlas Powder Co.
General Electric Co.
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Roofing
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Texas Co.

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Eagle Iron Wks.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Smith Engr. Wks.

Sand and Gravel Plants
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Bacon, Earle C., Co.
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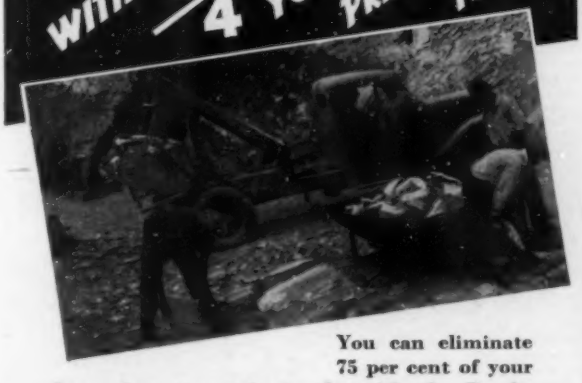
You can get TWICE the Production WITH 1/4 YOUR PRESENT TRUCKS



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The ONLY Truck Mixer with FEED CHUTE CHARGING

No Troublesome, Leaky Hatch to Open, Close and Keep Clean!

SMITH-MOBILE gives you the fastest loading cycle in the industry. It actually saves about two-thirds of the time required by old style truck mixers for the complete loading cycle. Here's why:

Old style truck mixers lose valuable time while driver climbs out of cab, stops drum, climbs on top of mixer, opens hatch, climbs down, gets into cab and drives mixer under the bin. After the mixer is loaded, the above process must be repeated in reverse with the additional operation of cleaning the edges of the hatch so it can be closed.

SMITH-MOBILE eliminates all these tedious operations. Standard equipment includes a big, roomy feed chute, easy to spot under bin gates. Driver can remain in cab. When mixer is loaded, he drives to the job immediately, with no delays for the unnecessary operations enumerated above. This means more loads per day—GREATER PROFITS.

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3½-4 Yd. Truck Mixer
(5-yard Agitator)

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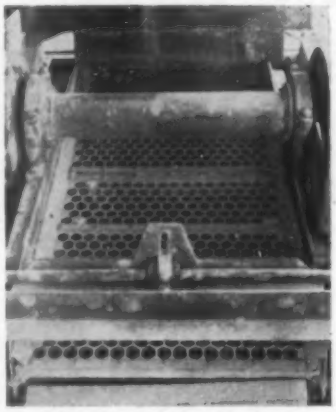
THE *Modern* TRUCK MIXER and AGITATOR

A 2461-½

CROSS PERFORATED METAL

FOR ALL TYPES OF SIZING EQUIPMENT



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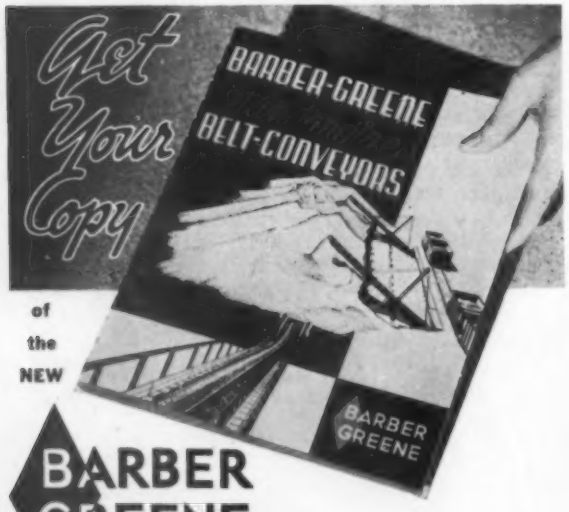

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Smith Engineering Wks.

Sand Settling Tanks
Chicago Bridge & Iron Co.
Eagle Iron Wks.
Hendrick Mfg. Co.
Link-Belt Co.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Smith Engr. Wks.

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Chain Belt Co.

Scales (Hopper)
Blaw-Knox Co.

Scrapers (Power Drag)
American Hoist & Derrick Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Diamond Iron Wks., Inc.
Hayward Company
Link-Belt Co.
Northwest Engineering Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Scrapers (Wagon)
Bucyrus-Erie Co.

Screen Cloth & Plates (Perforated)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Brooks Equipt. & Mfg. Co.
Chicago Perforating Co.
Cross Engineering Co.
Gruendler Crusher & Pulv. Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ityerson, Jos. T., & Sons, Inc.
Standard Stamping & Perforating Co.
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.

Screen Parts
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Diamond Iron Wks., Inc.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Pioneer Engineering Wks., Inc.
Screen Equipment Co.
Traylor Engineering & Mfg. Co.

Screens
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Diamond Iron Wks., Inc.
Eagle Iron Wks.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Ludlow-Saylor Wire Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's Sons Co.
Smith Engineering Wks.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Tyler, W. S., & Co.
Williams Patent Crusher & Pulv. Co.

Screens (Grizzly)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Productive Equipment Corp.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.
Ross Screen & Feeder Co.
Screen Equipment Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Screens (Laboratory)
Allis-Chalmers Mfg. Co.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Roebling's, John A., Sons Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.
Williams Patent Crusher & Pulv. Co.

Screens (Revolving)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy Co.
Bacon, Earle C., Inc.
Brooks Equipt. & Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Eagle Iron Wks.
Gruendler Crusher & Pulv Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.
Smith Engr. Wks.
Standard Stamping & Perforating Co.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.

Screens (Rotary)
Link-Belt Co.
Smith Engineering Wks.

Screens, Scalping
Allis-Chalmers Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Screen Equipment Co.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Screens (Trommel)
Link-Belt Co.
Traylor Engr. & Mfg. Co.

Screens (Vibrating)
Allis-Chalmers Mfg. Co
Austin-Western Road Machy Co.
Bacon, Earle C., Co.
Brooks Equipt. & Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Gruendler Crusher & Pulv Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co
Roebling's, John S., Sons Co.
Screen Equipment Co.
Smith Engineering Works
Sturtevant Mill Co.
W. S. Tyler Co.
Universal Vib. Screen Co.
Williams Patent Crusher & Pulv. Co.

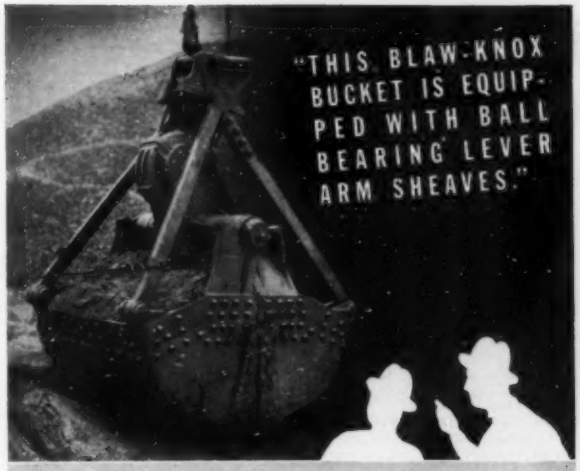
Screens (Washing)
Chain Belt Co.
Link-Belt Co.
Screen Equipment Co.

Scrubbers (Washers)
Link-Belt Co.
Smith Engineering Wks.
Traylor Engineering & Mfg. Co.
Tyler, W. S., & Co.

Seal Rings
Traylor Engineering & Mfg. Co.

Semi-Trailers, Quarry (Side and End Dumping)
Easton Car & Const. Co.

Septic Tank Molds (Concrete)
Suburban Sanitation Systems Co.



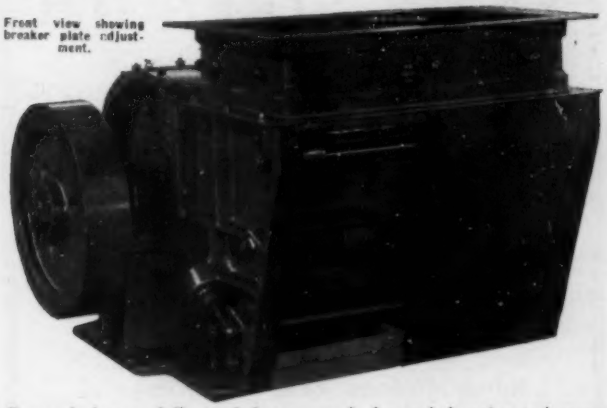
As a matter of fact this feature is standard equipment and does not cost more. It is especially desirable where the bucket handles loose granular materials because it keeps lubrication in and dirt out. This and many other desirable features of Blaw-Knox Buckets is fully described and illustrated in Bulletin No. 1606. Write for it today.

17

BLAW-KNOX *Digging and Rehandling* **BUCKETS**

BLAW-KNOX DIVISION
OF BLAW-KNOX CO.
Farmers Bank Bldg. Pittsburgh, Pa.

ADD NEW PRODUCTS AND NEW PROFITS WITH AN AMERICAN



Front view showing breaker plate adjustment.

Demands for carefully graded stone sand of rounded grains and coarse aggregates that will be free from stripping are opening new and profitable markets for the alert producer. With an AMERICAN on the job you can capitalize on this new market.

AMERICAN CRUSHERS have an outstanding record for long life, low power requirement, minimum upkeep costs, together with the fact that they produce a more uniform product.

Write for complete catalog.

AMERICAN PULVERIZER CO.

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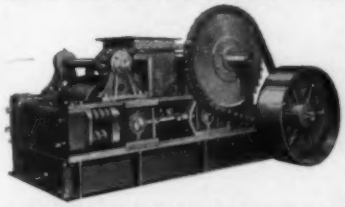
DIAMOND ROLL CRUSHER



Made with manganese roll shells easily removed from cast iron adjustable roll cores. Crusher equipped with roller bearings. Power applied to both shafts.

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IN LOUISVILLE

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A Brooks-Taylor lime putty plant will increase your business. Write for information.

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Birmingham.....1505 N. 50th Street
Tulsa.....1650 Hunt Bldg.
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Normal, general-purpose, masonry, plastering and stuccoing cements under the several BLANK patented processes.

Inquiries invited from producers of cement, lime and allied products.

Patents issued and pending in the United States, Canada, and in leading Central and South American and European Countries.

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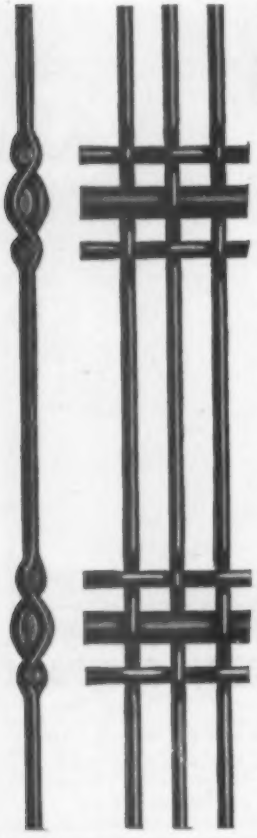

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Long-Mesh
Woven Wire Screens

made to work under tension and vibration.

The straight stay-bars carry ALL the tension. The crimps in the round wires can not be stretched or broken. The screen can not be caused to sag or split by the pull of the tensioning device.

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Link-Belt Co.

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Eagle Iron Wks.

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Gruendler Crusher & Pulv. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Roebling's, John A., Sons Co.,
Sanford-Day Iron Wks.
Sauerman Bros.

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Nordberg Mfg. Co.

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Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.

Shovels (Tractor)
Austin-Western Road Machy. Co.
Koehring Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Link-Belt Co.

Shovels (Underground)
Allis-Chalmers Mfg. Co.
Lima Locomotive Wks. (Shovel & Crane Div.)
Nordberg Mfg. Co.

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Tyler, W. S., Co.

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F. L. Smidth & Co

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Easton Car & Const. Co.

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Smidth, F. L., & Co.

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Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

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Smidth, F. L. & Co.

Slurry Thickeners
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

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Hendrick Mfg. Co.
Traylor Engineering & Mfg. Co.

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Bacon, Earle C., Co.
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Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

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Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Traylor Engineering & Mfg Co.

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Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Link-Belt Co.

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Besser Mfg. Co.
Gruendler Crusher & Pulv. Co.
Pioneer Engineering Wks., Inc.

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Chicago Bridge & Iron Co.
Ross Screen & Feeder Co.

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Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.
Joseph T. Ryerson & Son, Inc.

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Gilmore Wire Rope Div.
Jones & Laughlin Steel Co.,

Stokers
Babcock & Wilcox Co.
Link-Belt Co.

Storage Equipment
Barber-Greene Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Strippers (Concrete)
Anchor Concrete Machy. Co.
Besser Mfg. Co.
Multiplex Concrete Machy. Co.

Stucco Colors
Mepham, Geo. S., Corp.

Switchboards
Allis-Chalmers Mfg. Co.
General Electric Co.

Tachometers
General Electric Co.

Tampers (Power & Hand)
Anchor Concrete Machy. Co.
Besser Mfg. Co.
Kent Machine Co.
Multiplex Concrete Machy Co.
Stearns Mfg. Co.

Tanks
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
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Eagle Iron Works
Heltzel Steel Form & Iron Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Traylor Engineering & Mfg. Co.

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Towers
Blaw-Knox Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jaeger Machine Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Track & Track Equipment
Besser Mfg. Co.
Nordberg Mfg. Co.

Track Shifters
Nordberg Mfg. Co.

Track Systems (Overhead)
Link-Belt Co.

Tractors
Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.
Koehring Co.

Tractors (Electric)
Link-Belt Co.

Trailers (Industrial & Quarry)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Easton Car & Const. Co.
Koehring Co.
Sanford Day Iron Wks.

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.

Trucks (Agitator)
Blaw-Knox Co.
Chain Belt Co.
Jaeger Machine Co.
Smidth, F. L., & Co.

Truck Bodies (Dump)
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Easton Car & Const. Co.
Hendrick Mfg. Co.

Trucks (Electric)
Easton Car & Const. Co.

Trucks (Gas-Electric)
Easton Car & Const. Co.

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On Long Hauls . . . At Low Cost

Sauerman Slackline digs a pit 1000 ft. wide and 100 ft. deep, lifting material to the top of the plant in straight-line operation, at a cost of a few cents per cubic yard.

Excavation of sand and gravel—open storage of aggregate—handling of cement clinker—haulage of quarry products to crusher—these and many other material handling jobs are accomplished cheaply by means of Sauerman Drag Scrapers and Cableways.

Throughout the rock products industry—at gravel plants, stone quarries, gypsum and cement mills—Sauerman machines are rated as a most valuable plant asset because of their ability to move materials with a minimum expenditure of power and labor.

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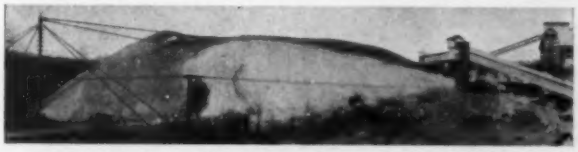
SAUERMAN BROS., INC.
430 S. Clinton St., Chicago



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LINK-BELT *Vibrating* SCREENS

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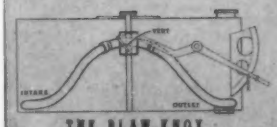
The BLAW-KNOX TRUKMIXER has the most accurate water measuring systems for all positions of the tank"



THE BLAW-KNOX WATER MEASURING SYSTEM

Tests show—only Blaw-Knox TKUKMIXERS have this accurate, practical, dependable water measuring system. Described in Bulletin No. 1643.

Buy Blaw-Knox Trukmixers. Get the advantage of automatic accurate water measurement, together with many other exclusive features.

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BLAW-KNOX BLAW-KNOX DIVISION OF BLAW-KNOX CO. Farmers Bank Bldg. Pittsburgh, Pa

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SEVEN MATERIALS IN ONE BIN?

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Blaw-Knox Truck Mixer Loading Plants include overhead storage bins for aggregates and cement; accurate Weighing Batchers for aggregates, cement and water; arranged for manual or automatic operation; complete conveyors for handling materials from cars or trucks to bins, when desired—all properly designed and built to your requirements as an efficient unit for truck mixer loading. See Blaw-Knox Catalog No. 1582.

18

BLAW-KNOX BLAW-KNOX DIVISION OF BLAW-KNOX CO. Farmers Bank Bldg. Pittsburgh, Pa

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BUILDS IT BETTER

HELTZEL MODERN STEEL BIN AND ELEVATOR EQUIPMENT FOR THE LIME PRODUCTS INDUSTRY.

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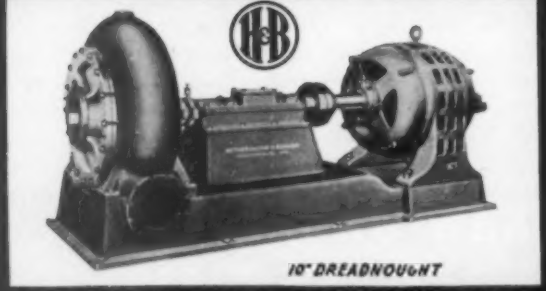

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Trucks (Mixers)
Blaw-Knox Co.
Chain Belt Co.
Jaeger Machine Co.
Smidth, F. L., & Co.
Smith, T. L., Co., The

Turbines
Allis-Chalmers Mfg. Co.
General Electric Co.

Turntables (Industrial)
Easton Car & Const. Co.

Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Fuller Company
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Robins Conveying Belt Co.

Unloaders (Boat)
Chain Belt Co.
Link-Belt Co.

Unloaders (Box Car)
Barber-Greene Co.
Besser Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Fuller Co.
Gruendler Crusher & Pulv. Co.
Link-Belt Co.
Stearns Mfg. Co.

Unloaders (Pneumatic)
Diamond Iron Wks., Inc.
Fuller Company

Unloaders (Underground)
Nordberg Mfg. Co.

Ventilating Apparatus
Blaw-Knox Co.

Vibrators (Bin and Concrete Form)
Besser Mfg. Co.
Link-Belt Co.
Stearns Mfg. Co.
W. S. Tyler Co.

Vibrating Screens
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Chain Belt Co.
Diamond Iron Wks., Inc.
Eagle Iron Wks.
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Screen Equipment Co.
Smith Engineering Wks.
Sturtevant Mill Co.
Tyler, W. S., & Co.
Universal Vibrating Screen Co.
Williams Patent Crusher & Pulv. Co.

Wagons (Dump)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Easton Car & Const. Co.
Koehring Co.

Washers (Log)
Allis-Chalmers Mfg. Co.
Chain Belt Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engr. & Mfg. Co.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Chicago Bridge & Iron Co.
Diamond Iron Wks., Inc.
Eagle Iron Works
Gruendler Crusher & Pulv. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.,
Smidth, F. L., & Co.
Smith Engineering Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Weighing Equipment
Blaw-Knox Co.
Chain Belt Co.
Fuller Company
Heltzel Steel Form & Iron Co.
Jaeger Machine Co.
Schaffer Poidometer Co.

Welding & Cutting Equipment
General Electric Co.
Roebling's, John A., Sons Co.

Welding Rods
Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.
Roebling's, John A., Sons Co.
Ryerson, Jos. T., & Son, Inc.

Welding Wire
American Chain & Cable Co.
Gilmore Wire Rope Div.
Hazard Wire Rope Div.
Jones & Laughlin Steel Corp.
Roebling's, John A., Sons Co.,

Wheel or Gear Pullers
Armstrong-Bray & Co.

Winches
American Hoist & Derrick Co.
Link-Belt Co.
Robins Conveying Belt Co.

Wire Cloth
Bacon, Earle C., Co.
Cleveland Wire Cloth & Mfg Co.
Eagle Iron Works
Leschen, A., & Sons Rope Co
Link-Belt Co.
Ludlow-Saylor Wire Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.,
Screen Equipment Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Wire (Copper, Iron & Steel)
General Electric Co.
Roebling's, John A., Sons Co.,

Wire (Electric)
General Electric Co.
Roebling's, John A., Sons Co.,

Wire Rope
American Cable Co., Inc.
Gilmore Wire Rope Div.
Hazard Wire Rope Div.
Jones & Laughlin Steel Corp.
A. Leschen & Sons Rope Co
Roebling's, John A., Sons Co.,

Wire Rope Clips
American Cable Co.
American Hoist & Derrick Co.
Gilmore Wire Rope Div.
Hazard Wire Rope Div.
Jones & Laughlin Steel Corp
Leschen, A., & Sons Rope Co
Roebling's, John A., Sons Co.,

Wire Rope Fittings
American Cable Co.
American Hoist & Derrick Co.
Gilmore Wire Rope Div.
Hazard Wire Rope Co.
Jones & Laughlin Steel Corp.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Wire Rope Hooks
American Cable Co.
American Hoist & Derrick Co.
Hazard Wire Rope Div.
Leschen, A., & Sons Rope Co.

Wire Rope Lubricants
Roebling's, John A., Sons Co.,
Texas Co.

Wire Rope Slings
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Hazard Wire Rope Div.
Jones & Laughlin Steel Corp.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

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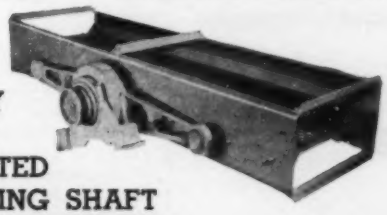

1. COMPLETELY ADJUSTABLE
2. OIL LUBRICATED
3. FULL FLOATING SHAFT
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PRODUCTIVE EQUIPMENT CORP.
4600 SOUTH KEDZIE AVENUE CHICAGO U.S.A.

RYERSON CERTIFIED STEELS

UNIFORM HIGH QUALITY STEELS
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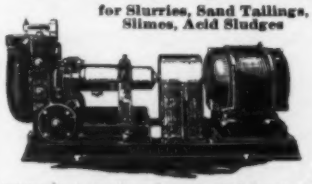
Accurately controlled by definite specifications, Ryerson Certified Steels represent the highest quality obtainable in each class and type of material. Special abrasion resisting steels, perforated metals and other products for the Rock Products industry are included. A special plan on alloy steels gives the user exact data on every bar. When you need steel, phone, wire or write the nearest Ryerson plant. Immediate Shipment is assured. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON *Certified* **STEELS**

WILFLEY
centrifugal SAND PUMPS

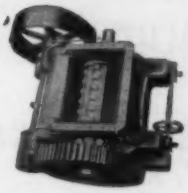
for Slurries, Sand Tailings, Slimes, Acid Sludges



Save Pumping Costs

Continuous operation without attention for long periods. Stuffing box, stuffing, gland water ALL eliminated. Close clearances maintained by easy slippage seal adjustment. Heavy pumping parts of material best suited for YOUR particular problem. Complete engineering service. Prompt shipment of parts. The most efficient and economical pump you can buy. *Write for Complete Catalog*

A. R. WILFLEY & SONS, Inc., Denver, Colo., U. S. A.
NEW YORK OFFICE: 1775 BROADWAY



McLANAHAN EQUIPMENT

CRUSHERS

Single and double roll and jaw crushers, hammer mills, super dry pans—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.

SCREENS

Complete portable, semi-portable and stationary crushing, screening, and washing plants for different capacities of any materials.

McLanahan & Stone Corp.
Established 1835
HOLLIDAYSBURG, PENNSYLVANIA

HAYWARD BUCKETS

USE RIGHT BUCKET FOR THE JOB

Hayward makes all four—clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

THE HAYWARD COMPANY
202-204 Fulton Street
New York, N. Y.

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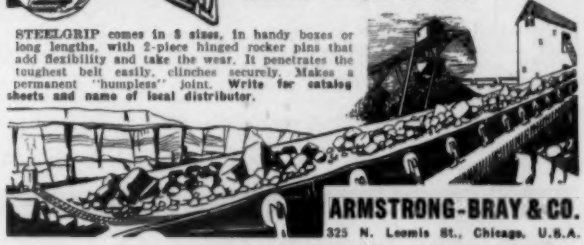
FOR HEAVY "OUTDOOR" DRIVES

As manufacturers of both types of flexible belt lacing, we recommend STEELGRIP for heavy drives, conveyor belts and outdoor jobs for: (1st) It can be applied anywhere—all you need is a hammer. (2nd) It compresses and protects belt ends—prevents fraying, adds to belt life. It is flexible and easily detachable. (3rd) It stands corrosion and erosion better than the lighter belt hooks.

STEELGRIP comes in 8 sizes, in handy boxes or long lengths, with 2-piece hinged rocker pins that add flexibility and take the wear. It penetrates the toughest belt easily, clinches securely. Makes a permanent "humpless" joint. Write for catalog sheets and name of local distributor.



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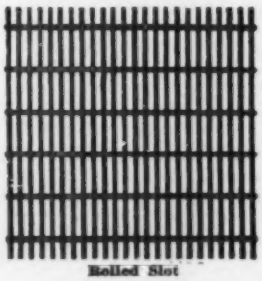

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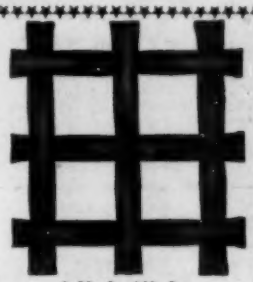
ALLOY No. 2

STAR PERFORMERS

CLEVELAND SCREENS are star performers—returning larger capacities, increased profits and more accurate separations at lower cost. Cleveland Screens save money with the initial investment because, if they are made of the longer-wearing, wear-resisting ALLOY NO. 2—Cleveland Screens stay on the job long after ordinary screens would have been replaced.

★ ★

THE CLEVELAND WIRE CLOTH & MFG. CO.
3574 E. 78TH STREET . . . . . CLEVELAND, OHIO



2 Mesh .162 Ga.

MORE PROFITS FOR YOU

Classified Advertisements

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POSITIONS WANTED — POSITIONS VACANT Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION—Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $5.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

IMMEDIATE LIQUIDATION

of former

MARIANNA LIME PRODUCTS CO.
WHITE CLIFFS, ARK.

RAYMOND HIGH SIDE ROLLER MILLS

3—4-roll Raymond High Side Pulverizers, for finenesses up to 99.5% through 325 mesh, each mill complete with 7' dia. vacuum separator, No. 11 Raymond exhauster, cyclone collector, 7' dia. tubular dust collector and all inter-connecting piping.

1—7' dia. x 56'8" long DIRECT OR INDIRECT HEAT ROTARY DRYER, made by L. R. Christie Co., Pittsburgh, Pa. Oil fired, equipped with special inner shell, exhauster, feeder, screw conveyor for discharged product; 9" wide girth gear, 8½" wide tires, 7/16" shell.

1—5'x30' RUGGLES-COLES DIRECT HEAT ROTARY DRYER, double shell with connecting flue and steel adaptor housing for feed end.

1—1 YD. DIESEL OPERATED COMBINATION SHOVEL AND DRAGLINE, BUCYRUS-ERIE D-2 CRAWLER MOUNTED, WITH ATLAS IMPERIAL FULL DIESEL ENGINE, 40' STEEL BOOM, PAGE SCRAPER DRAGLINE BUCKET; SHOVEL EQUIPMENT—BOOM 23' LONG, DIPPER HANDLE 15', 1 YD. BUCKET.

1—30"x54" OCALA SINGLE ROLL CRUSHER, toothed rolls, manganese steel liners, steel housing.

HAMMER MILLS:

1—No. 6 Williams "Jumbo" Hammer Mill, 42" wide, 12 hammers per row, 8" dia. main shaft with Texrope drive and 200 H.P. Allis-Chalmers 3/60/2200 volt, 705 RPM, slip ring motor.

1—No. 4 Williams "Jumbo" Hammer Mill, 24" wide, 7 hammers per row, manganese steel liners, belt driven.

BELT CONVEYORS:

15—18" Belt Conveyor; 15' c/c, 15' c/c, 20' c/c, 22' c/c, 22' c/c, 38' c/c, 63' c/c, 76' c/c, 100' c/c, 100' c/c, 115' c/c, 120' c/c, 120' c/c, 140' c/c, 140' c/c.

BUCKET ELEVATORS:

5—40' c/c Bucket Elevators, 9x18" steel buckets, double chain, wood housings.

1—No. 30 Caterpillar Tractor.
1—60 H.P. Fairbanks-Morse Single Cylinder Diesel Engine, Type Y, Style VA.
1—10"x8" Ingersoll-Rand ER-1 belt driven Air Compressor.
1—No. 1½ GT Clipper Well Driller, mounted on steel wheels, gasoline driven.
1—Pratt Box Car Portable Loader, 17" belt, 10' c/c.
2—Howes belt driven Bag Packers.
4—Ingersoll-Rand Jackhamers.
3—207 H.P. Geary Water Tube Boilers with boiler feed pumps and Cochrane feed water heater.
1—150 KVA Engine Generator Set, Skinner slide valve engine, Crocker-Wheeler generator, 3/60/240 volts, with belted exciter.

RAILROAD RAIL:

6000 Ft., 25-Lb.
5000 Ft., 65-75-Lb.
Galvanized Steel Corrugated Sheets, 80,000 sq. ft.

SPECIAL ITEMS

WRITE NEW YORK OFFICE FOR QUOTATIONS

1—18x36" Farrel Jaw Crusher.
2—3' Symons Cone Crushers with direct connected 50 H.P., 3/60/440 volt motors.
1—No. 37 Kennedy Reduction Crusher, with 3/60/440 volt motor in pulley.
6—Belt Conveyors, trough type; 30" 212' c/c; 24" 237' c/c; 20" 212' c/c; 252', 288', 302' c/c.
1—4' Traylor Reduction Crusher, No. 410-TZ, 10" feed.
1—25 ton Browning Locomotive Crane now in operation at Belleville, Mich.
1—55 ton Standard Gauge Gasoline-Electric Locomotive.
1—5' I.D. x 36' TUBE MILL, Vulcan Iron Works, iron lined, 3 compartments.

REPRESENTATIVE ON PREMISES

Write, Telephone or Wire

CONSOLIDATED PRODUCTS CO., INC.
TEXARKANA, ARK.

FOR SALE

2—Link-Belt Dewaterizers with 30" x 16" x 18" pitch Continuous Bucket Digging Elevators 35' Centers 400 tons capacity.

KOENIG COAL & SUPPLY COMPANY
1486 Gratiot Ave., Detroit, Michigan

DIESEL OIL ENGINES
10 to 1000 HP.
At prices you can afford to pay.
Electric light plants. Compressors. Quarry, Sand and Contractors' Equipment.
J. D. Anderson Machinery Co.
3516 Maple Ave., St. Louis, Mo.

FOR SALE

2—Link-Belt dewatering elevators, 36' centers, complete with all steel supporting structure and drive machinery.
2—Strut bar, revolving, scalping screens, 48" diameter, 12' long, with drive machinery.
1—Sauerman, 2 Cu. Yd. capacity, slackline, electric hoist with 150 H. P. motor and starting equipment.

TERRE HAUTE GRAVEL COMPANY
TERRE HAUTE, INDIANA

New—RAILS—Relaying
ALL SECTIONS

Also contractors' equipment, "V" shaped and Western cars, 24 and 36-in. gauge, portable track, gas locos, frogs and switches. Attractive prices quoted. Wire, write or telephone for quotations.

M. K. FRANK

480 Lexington Ave., New York, N. Y.
25 St. Nicholas Building, Pittsburgh, Pennsylvania

SAVE

Bolted type steel bins will cost you less erected than ordinary wood bins.

New and Used Pipe and Tubing

Jos. Greenspon's Son Pipe Corp.
Natl. Stock Yds. (St. Clair Co.) Ill.

FOR SALE

1—3 Ton Overhead Electric Crane, 80' Runway 40' Span.
1—Sauerman Dragline Scraper, 2 Yd. 75 H.P.
1—Bartlett & Snow Skip Hoist, 2 Cars, 82 H.P.
1—16" All electric suction dredge.

Address all inquiries to Box 863, Care of Rock Products, 205 W. Wacker Drive, Chicago, Ill.

"E. C. A. Rebuilt" Quarry and Gravel Plant Equipment

AIR COMPRESSORS

Portable and stationary, belt with elec. or gas power, sizes from 21 cu. ft. to 1,800 cu. ft.

BINS

2—3-compartment with scales. 10,000 lbs. cap.; 1—150 ton Blaw Knox; 1—112 ton Butler.

6—2-compartment: 1—118 ton Blaw Knox; 1—117 ton Blaw Knox; 1—60 ton Johnson; 1—60 ton Butler; 2—35 ton Blaw Knox. With or without weigh batchers.

1—1,200 bbl. Blaw Knox round bulk cement bin with 2,000 lbs. weigh batcher.

1—275 bbl. Johnson port. bulk cement plant with 1,000 lbs. weigh batcher, bucket elevator and car unloader.

BUCKETS

1—4-yd. class G Hayward clamshell.

35—Williams, Blaw Knox & Owen clamshell, all sizes and types.

7—Dragline: 1—1¾ yd. Northwest; 1—1½ yd. Omaha. 5—Page: 1—1¾ yd. class C; 3—1¼ yd. class C; 1—1 yd. class M; 1—¾ yd. class C.

3—Dragscraper: 1—1 yd. Sauerman LeClair; 1—1 yd. Green; 1—½ yd. Green.

CRANES, DRAGLINES and SHOVELS

1—Link Belt K-55 ser. No. 1698, 70' boom, 2 yd. bucket; also have 2 yd. shovel attachment.

1—Lorain 77-D, ser. No. 5632 (new 1938) powered by Caterpillar mod. 13,000 Diesel engine, 60' boom, 1¼ yd. Kiester clamshell bucket.

1—P & H mod. 650, ser. No. 4133, 65' box type boom, 1¾ yd. bucket.

2—Northwest mod. 104, ser. Nos. 2079 & 1597, 45' boom, 1¼ yd. bucket; one with 1 yd. shovel attachment.

1—Link Belt K-42, ser. No. 1265, 45' boom, 1⅛ yd. bucket; also have 1 yd. trench hoe attachment or 1¼ yd. shovel front.

2—Northwest mod. 105, ser. No. 2053 & 1522, 40' boom, 1 yd. bucket.

1—Link Belt K-1, ser. No. 1024, 50' boom, 1 yd. bucket.

2—Osgood Heavy Duty, ser. Nos. 2069 & 2087, 40' boom, 1 yd. bucket & one with 1 yd. shovel attachment.

1—Bucyrus Erie Model 1030, ser. No. 10512, comb. crane with 48' boom & ¾ yd. shovel front.

2—Northwest mod. 2, ser. Nos. 4797 and 3172, 40' boom, ⅝ yd. bucket.

1—Universal mod. 35, ser. No. 1200, 56' boom, ½ yd. bucket.

1—Erie type B-2 ser. No. 4122, 1 yd. combination steam shovel & crane, 40' boom.

CRANES (Locomotive)

1—12 ton Brownhoist gas. powered locomotive crane No. 2, ser. No. 8881, 8 wheel, 40' boom.

CRUSHERS

4—Gyratory: 1— No. 20 Kennedy; 1—Weston 36-B fine reduction type with 50 HP motor. Cap. 90 TPH of 1" mat. 1— No. 3 McCully; 1— No. 0 McCully.

3—Jaw crushers: 1—14x36" Cedar Rapids; 1—10x20" Climax No. 2½; 1—9x16" Telsmith No. 98.

1—Set of Allis-Chalmers smooth type crushing rolls, 42x16".

DERRICKS

4—Steel stiff leg: 1—15 ton Clyde, 50' boom; 1—15 ton Clyde "A" frame barge derrick, 50' boom; 1—10 ton Insley, 90' boom; 1—5 ton Insley, 80' boom.

6—Steel guy derricks: 1—15 ton Terry, 115' mast, 100' boom; 1—10 ton American, 115' mast, 100' boom; 3—6 ton Bedford, 90' mast, 80' boom; 1—5 ton Dobbie, 70' mast, 58' boom.

WHIRLEY

1—Mod. 75 Wiley Whirley No. 2973, 20 tons cap., 75' boom, 8D Clyde 60 HP elec. hoist & 30 HP elec. swinger, all complete. Perfect condition.

SEND FOR COMPLETE NEW STOCK LIST.

EQUIPMENT CORPORATION OF AMERICA

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CHICAGO — 1119 S. Washtenaw Ave. Phone Nevada 2400
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CONCRETE-CEMENT PLANTS

Johnson concrete plant, 100 yds. complete with bulk cement bin, conveyor, weigh batchers, New 1937.
250 bbls. Blaw Knox cement bin, elevator, screw conveyor, weigh batchers, etc., complete plant.
155 bbls. Fuller cement bin, electric weigh batchers.
110 tons Blaw Knox, steel, 2 compts., weigh batchers.
300 bbls. Heltzel cement bin, screw conveyor, elevator.
2 Smith 1 yd. concrete mixers, skid mounted, water tank, hopper and tell tale, electric motor driven.
1 Fuller Kinyon Type B portable cement loader.
1 Fuller Kinyon rotary air compressor.

CRUSHERS—JAW—CONE—GYRATORY

Jaw—6x12, 9x16, 10x20, 12x26, 12x30, 18x36, 24x36.
Gyratory—Gates K, Nos. 4, 5, 6, 7½D, Kennedy Van Saun, Nos. 30, 27, 378, 49, McCully Nos. 5, 6, McCully Superior 3".

CRANES—SHOVELS—DRAGLINES

1 Clyde Whirley, 25 tons cap., 105' boom, oil fired steam.
1 Browning, electric loco. crane, 15 tons, 45' boom.
1 Marion electric shovel-crane, 1¼ yds., caterpiller.
1 Lima, gas, caterpiller, 1¼ yds., crane-dragline.
1 Lorain, gas, caterpiller shovel, 75B—1½ yds.

CLAM SHELL—ORANGE PEEL BUCKETS

2—Williams Favorite ¾ yd. digging clamshell.
1—Moore Trench ¾ yd., digging clamshell.
1—Williams Hercules 1½ yd. digging clamshell. NEW.
1—Hayward 1 yd. orange peel.
1—Hayward ¾ yd. orange peel.

CONVEYOR EQUIPMENT

Jeffrey 20" conveyor, 400' centers, steel frame complete. Has 50 hp. motor, roller bearing rollers.
Barber Greene conveyors, 24", steel frames electric drive, 35' to 45' type N.
Belt conveyors, complete, steel frames, belt and motors, 24", lengths, 45' to 200'.
Conveyor belt, 18", 20", 24", 36".
Head & tail pulleys, take-ups, rollers, idlers.

MISCELLANEOUS

Dredge pumps, 6", 8", 10", 12", 16".
Gas locomotives, 2½ to 35 tons.
V type, side dump steel cars, 2 & 3 yds., 36" ga.
3—Sauerman Crescent ¾ yd. dragline buckets.
Sauerman double drum, gas, dragline hoist, 65 h.p.
Steel stone skips, 1½, 2, 4 yds.
Derricks, Clyde steel stiff leg, 80' boom, 10 tons.
Clyde 3 drum & attached swinger, electric hoist, 75 h.p.

RICHARD P. WALSH CO.
30 CHURCH STREET, NEW YORK, N. Y.

Kennedy No. 19 and No. 10 McCully Reduction Gyratory.
9x18" Indiana Portable Jaw—Very low price.
16x16" New Holland, 28x16" & 42x20" Kennedy.
40x15 and 54x24" Anaconda.
18x12 & 40x16" Gruendler Crushing Rolls.
20 ton 8-wheel std. ga. Locomotive Crane fine.
NEW 2000 watt Gas Light Plant 25-110V DC.
200 HP Fulton Diesel Generator Set—2300—220V.
2—220 CFM Chgo. Pneu. Oil Portable Compressors.
Vibrating Screens—all makes and sizes.
Anything and everything for Quarry Operation
Let us have your inquiries and ask for Bulletin No. 45.

MID-CONTINENT EQUIPMENT CO.
710 EASTGATE — PA. 2290 — ST. LOUIS, MO.

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5 ton BS 3 wheel road roller
⅝ yd. Byers rock shovel
¼ yd. Byers comb. shovel-crane
1 yd. and ¾ yd. Owen & Williams buckets
Barnes pumps SP, 3, 4, 6, gas & elec.
Cat 30 tractor bulldozer
Compressors: 110, 275, 310, 446 CF
Jackhammers, busters and spades
Insley shoulder machine
3—50 HP 8D electric hoists
Boom and front drum for Erie B.
Brisbane Bldg. — J. T. WALSH — Buffalo, N. Y.

FOR SALE

Model 70 Marion steam shovel 2½-yard bucket, workable condition.
Two 27 ton American locomotives, standard gauge.
Can be seen at Osborn, Ohio.

WABASH PORTLAND CEMENT CO.
DETROIT, MICHIGAN

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Teuscher Pulley & Belting Co.
St. Louis, Mo. Since 1899

DIESEL ENGINES

MOTORS — GENERATORS
AIR COMPRESSORS — PUMPS
IMMEDIATELY AVAILABLE FROM STOCK

A. G. Schoonmaker Corporation
42 Hudson St., Phone Bergen 4-5300, Jersey City, N.J.

ELECTRICAL MACHINERY

Motors and Generators. A.C. and D.C., for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.
Fort Wayne, Indiana

REBUILT CONSTRUCTION EQUIPMENT

Air Compressors
Belt Conveyors
Concrete Vibrators
Derricks
Elec. Motors & Controls
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Gasoline & Elec. Hoists
Concrete Buckets
Material Elevator Platforms
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Concrete Mixers
Plaster Mixers
Mortar Mixers
Centrifugal Pumps
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UNITED HOISTING CO., INC.
Serving Construction Industry for 46 years.
Locust Ave. & E. 135th Street, New York, N. Y.

FOR SALE

One Sauerman Slackline Cableway complete with 80 ft. steel mast, one yard bucket, 80 H.P., two speed hoist, electric. All Sauerman equipment throughout. None Better, extra good bargain.

JOHN JONES & SONS GRAVEL CO.
Indianapolis - - - - - - Indiana

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GYRATORY: 42" McCully with 80% brand new parts. 12-N Allis-C. 36" Superior McCully like new. 20" Superior McCully reduced to 16". Telsmith Nos. 4, 5, 6 & 9. Gates Nos. 10, 9, 8, 7½, 6, 5 4 & 3. Also Austins, Kennedys and Traylors.
JAW TYPE: Traylor 84x66, 60x48, 30x60 & 24x72. Buchanan 52x72 & 30x42. Farrel 24x36 & 30x36. P&M 24x28. Good Roads 1030 & 1040. Bakstad 3-jaw 8x20. Misc. 9x16, 8x36, 15x36, Etc.
REDUC. TYPE: 6, 10 & 18" Super. McCulley. 2', 3' & 4' Symons Cone. 7" & 16" Newhouse, Etc.
ROLLS: Allis-C. 36x16, 40x15 & 54x24. Jeff. 30x30.
HAMMERMILLS: Williams Nos. 3, 4, 5 & 9. Others.
MILLS: Kennedy Ball 4x6, 5x6 & 5x8. Kent 34x7". 48" Fuller-Lehigh. 5'x22' Bonnot and others.

MISCELLANEOUS ITEMS

Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryers, Derricks, Draglines, Dredges, Drills, Engines, Excavators, Elevators, Generators, Hoists, Kilns, Loaders, Locomotives, Motors, Pipe, Pumps, Rail, Screens, Slacklines, Shovels, Tanks, Trucks, Tractors, and many other items located throughout the United States at Bargain Prices.

ALEXANDER T. McLEOD
7229 ROGERS AVENUE — CHICAGO

ANNOUNCEMENT

We have recently acquired the business of Equipment Sales Company (R. W. Storrs, Jr.) of Richmond, Va., and would very much like to continue to serve you as in the past, giving prompt and efficient service.

All sizes and types of Jaw and Gyratory Crushers, Ball Mills, Crushing Rolls, Raymond Mills, Vibrating Screens, Kilns, Air Separators, Dryers, Air Compressors, etc.

WE ARE INTERESTED IN YOUR SURPLUS EQUIPMENT

BRILL EQUIPMENT CORPORATION
183 Varick Street
New York, New York

¾ Yd. Buckeye Crane-Dragline. Full revolving. A-1.
30' B-G Coal Conveyor—Crawler type. Overhauled.
Barber-Greene Loaders & trench machines. Also Haiss.
Link-Belt K-44 Shovel-Crane-Drag. Also K-45.
Shovel & Trench Hoe Attachments. Crane Booms, etc.
Browning Truckcrane, pneu. tires. Also Universals.
Locomotive Cranes—Gas & Steam. 7½ to 40 ton cap.
Gas. Locos.—24", 36" & std. gauge, 5 to 30 tons.
Reduction Crushers—10"—7" Newhouse, 10" Sup-Mo.
Buckets—Prac. full line. Some are like new.
JAMES WOOD, 53 W. Jackson Blvd., Chicago, Ill.

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All Sizes — Any Quantity
Write for Quotations

Midwest Steel Corporation
CHARLESTON, W. VA.
Tie Plates — Angle Bars — All Accessories

STANHOPE OFFERS

AIR COMPRESSORS
BELTED: 353, 528, 676, 1000, 1200 & 1570 Ft.
ELECTRIC: 473, 676, 807, 1302, 1722 & 2200 Ft.
DIESEL: 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 220, 310 & 540 Ft.
STEAM: 49, 310, 528 & 1200 Ft.

CLAMSHELL BUCKETS AND SKIPS
Owen R A & H Stone Grapples.
2 Yd. OWEN Type S Material Handling.
1¼ Yd., 1 Yd. & ¾ Yd. HAYWARD Class E.
48 Steel skips 6½ x 6 x 2½.

CRANES & DRAGLINES
⅝ Yd. 5 Ton Brownhoist 30 Ft. Boom.
5 Ton 10 B Bucyrus, Gas, 28' Boom.
12 Ton NORTHWEST 50 Ft. Boom Gas.
25 Ton BROWNING & 30 Ton AMERICAN Locos.
25 Ton LINK BELT K-43 Electric, 70 Ft. Boom.

CATERPILLAR SHOVELS
⅜ Yd. BYERS Electric.
⅜ Yd. KOEHRING Gasoline.
¾ Yd., 1¼ Yd. & 2 Yd. MARION Electrics.
1 Yd. NORTHWEST Gas.
1½ Yd. BUCYRUS 41B Steamer.
4 Yd. Bucyrus 120 Electric.

DUMP CARS
40—KOPPEL 1½ Yd. 24 & 30 in. Ga., V Shaped.
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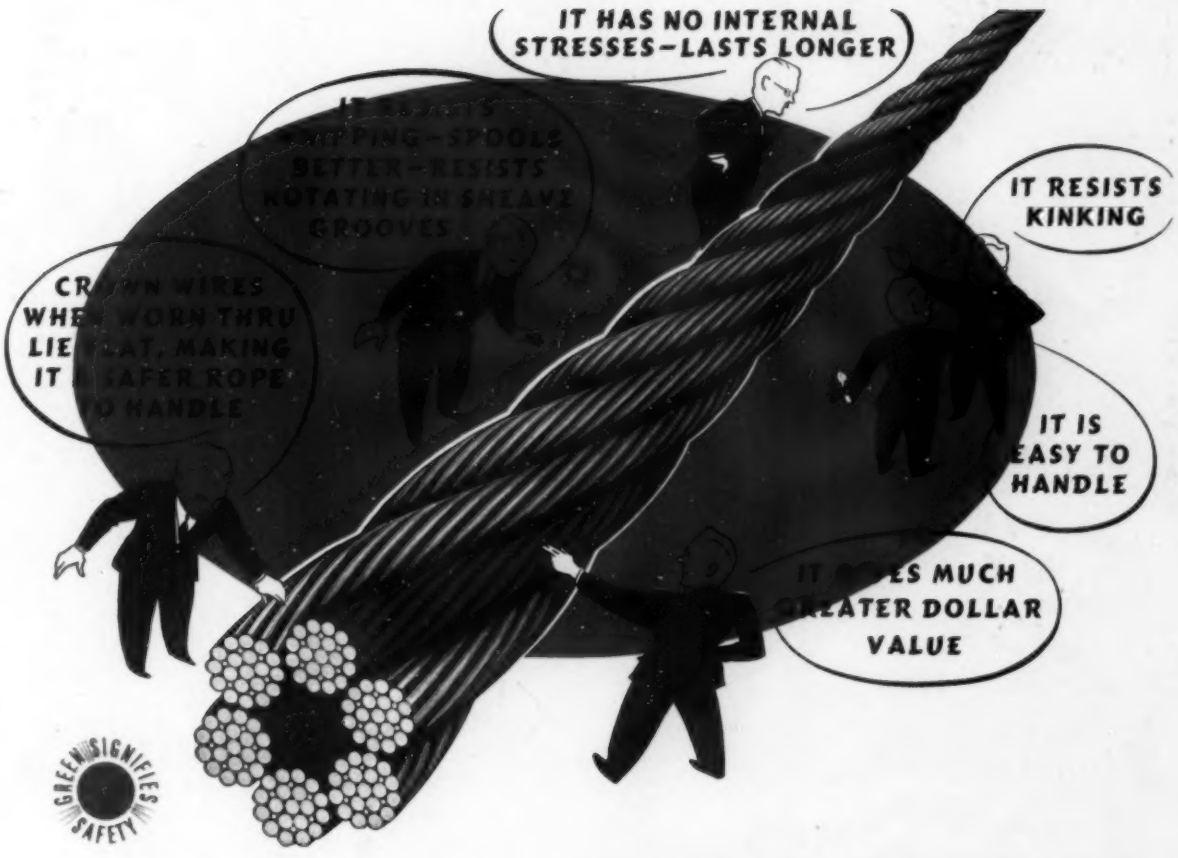

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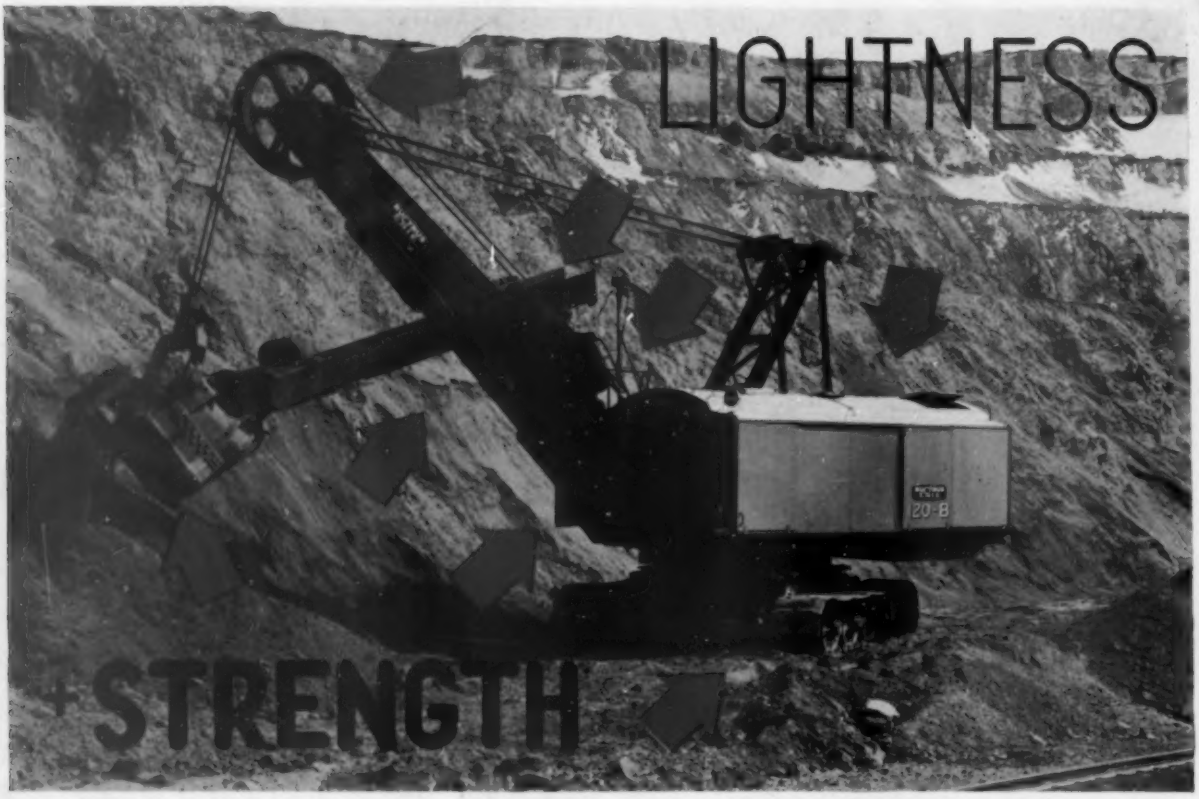

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The lighter front-end requires less counterweight, less ponderous bulk throughout the machine, to achieve maximum strength in exactly the places where strength is essential. This means faster swing, bigger output and a decreased power bill.

There is a machine in the complete Bucyrus-Erie quarry and mining line to fit your needs. Ask us to show you what Bucyrus-Erie's bigger output can mean in your pit.

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